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As Time Goes By: Temporal Characteristics of Social Media and Information Objective-Subjective Tensions in Crisis Communication

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Abstract. Social media communication is integral to framing an effective crisis response but is generally impacted by high volumes and an overload of information and misinformation, i.e., infodemic conditions. The social media connection content (i.e., information) and connection type (i.e., communications strategies) that are shared between actors (e.g., emergency response organisations and the public) underpins the development of trusted shared situational awareness for effective crisis management. This study investigates how local public health organisations use Facebook to mitigate COVID-19 misinformation and create effective trusted shared situational awareness. We show how the nature of the event and social media temporal characteristics can create information objective-subjective tensions and create misinformation on public health social media channels. This undermines an agreed and accurate representation of reality that is expected of trusted, shared situational awareness. We conclude that developing communications strategies to manage information objective-subjective tensions becomes especially important during an evolving crisis scenario where situational awareness and knowledge are developed over time and information and advice may change in response to a changing crisis conditions.

Keywords: social media, crisis communication, infodemic, trust, misinformation, health communication.

1 Introduction

Widespread social media use has exacerbated infodemics, defined as a rapid spread of all kinds of information, including misleading or false information (misinformation) in digital and physical environments during an epidemic [1]. Even though the word "infodemiology" was coined in 2002 [2], concerns about the digital spread of misinformation have been present since the World Wide Web was first launched [3]. Misinformation spread globally alongside the COVID-19 pandemic on social networks, e.g., Twitter, Facebook, TikTok, and other social media platforms, which became a major concern for societies [4],[5]. The infodemic phenomenon influenced and fragmented social response, impacted the efficiency of government countermeasures, and resulted in the pandemic's acceleration [6].

Information technologies such as social media platforms became a critical means of social interaction during the COVID-19 pandemic [7]. Social media use in the initial stages and during the COVID-19 outbreak resulted in the generation of a vast amount of information (both accurate and inaccurate), creating an infodemic not seen in previous viral epidemics like SARS and MERS. The COVID-19 infodemic disseminated information, misinformation, and rumours with a range, reach, velocity, and volume, which complicated the pandemic response, creating confusion and distrust among the public as well as risks to public health, hampering effective crisis management [8].

Official and trusted social media channels, including those located on Facebook, Weibo, Instagram, Twitter, LinkedIn, Pinterest, and official public health agency websites, were also actively used to provide timely and accurate information to mitigate infodemic and misinformation impacts. However, the flood of misinformation countered by a flood of corrective information caused public confusion about which sources of information were reliable [9]. This problem contributed to the destruction of mental model alignment, i.e., public trust in shared situational awareness [10], and resulted in worldwide panic and fear [11].

Boell [54] discusses the *Four Stances on Information* which encompass the physical, objective, subject-centred and sociocultural perspectives of information depiction. Each stance is underpinned by assumptions regarding information existence in the world, the condition for that existence, data (definition), knowledge (definition), signs, human beings (as creators, interpreters, and appropriators), social context, technology use and relevance to IS research.

As mental model alignment [10] is essential for the creation of trusted shared situational awareness, the development of an objective stance of information and its underlying assumptions for use in crisis communications, is a critical factor. Information and the communication solutions in this space must "be researched as an objectively existing artifact, with a particular interest in the accuracy of representations enabled or captured by IT artifacts" [54 - p.11]. Given that it can be argued that social media as an IT artifact, is subject-centred in its underlying information systems assumptions [10] this presents us with a *stance tension* in the IT artifact where an information objective-subjective divide must be bridged for effective infodemic solutions.

It is here that we turn to Seppänen et al., [12] which highlights the importance of shared understanding of situational awareness for emergency response and which identifies the critical factors that affect the formation of shared situation awareness 1) information, 2) communication, and 3) trust.

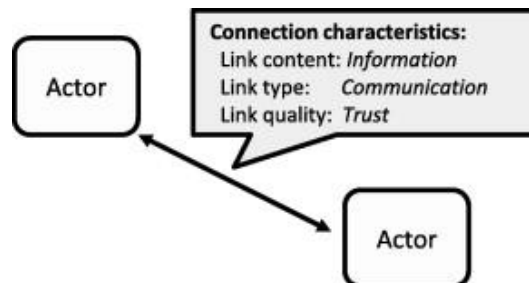


Fig. 1. Information, communication, and trust affect the formation of shared situational awareness for emergency response (source; [12])

As shown in Fig. 1, the connection between actors via content (information), type (communication), and quality (trustworthiness) are all key elements in creating shared situational awareness during a crisis. However, processing high volumes of information communicated through social media platforms is problematic for emergency response agencies because it is difficult to authenticate the trustworthiness of actors to establish the accuracy and relevance of the information itself [13]. This presents us with an information objective-subjective tension in the *condition of existence*, where information needs to be both 'a representation of reality' but also 'meaningful and relevant to a human being'. As we have seen in the pandemic infodemic, social media is effective at providing subject-centred meaningful and relevant information but is not well suited to providing an objective representation of reality due to its underlying algorithmic design which reinforces individual subjective perspectives [10].

This study intends to bridge the information objective-subjective divide by utilising Seppänen at al., and their approach [12] to determine how the spread of misinformation on social media i.e., Facebook affects the formation of trusted shared situation awareness. Within our study, we investigate *how local health organisations in Australia, at state levels, use social media i.e., Facebook content (information) and type (communication strategies) to mitigate COVID-19 misinformation propagation and how this knowledge might be used to enhance the development of the quality of shared situational awareness (trust)*.

Our study reveals the factors that should be considered in creating the *content (information) and type (strategies)* of official social media crisis communication to bridge the information objective-subjective divide that fuels infodemics.

The COVID-19 pandemic and the disruption it has produced in the age of social media is remarkable. The COVID-19 infodemic is a current and urgent information systems problem, which requires an effective solution, so our research is timely. Furthermore, our analysis has revealed how the nature of the event leads to the creation and spread of misinformation in a previously unidentified manner. Emergency management agencies such as public health agencies can use our results as a first step in the development of effective crisis communication strategies to fight an infodemic in a digital context.

2 Background - Social Media Crisis Communication

Our social connections, individual and collective activities, and dominant attitudes are all influenced by social media [14]. During crises, the public's interest in using social media increases [15]. People seek timely and unfiltered information during a crisis or an emergency to raise their concerns and express sentiments [16], [17]. They also use these platforms to determine disaster magnitude, check-in with family and friends, maintain a sense of community, seek and express physical and emotional support, and to make sense of an event [18],[19].

Although social media platforms are well-known as crisis communication tools, information is also created, catalysed, and distributed by these channels due to their nature and characteristics [20]. These platforms provide an enormous opportunity for "fake news" and "misinformation" to reach a mass audience [21], [10].

For instance, the propagation of vast amounts of accurate or inaccurate COVID-19 related messages during the pandemic was remarkably confusing and misleading for an uninformed public [22]. Social media amplified misinformation, disinformation, and unverifiable content at an alarming rate that hampered effective crisis communication about the pandemic [23]. To counteract this situation and mitigate the risks associated with misinformation propagation, the WHO Information Network for Epidemics (EPI-WIN) was launched by the WHO risk communication team as a new information platform to share timely, tailored, accurate and relevant information with target audiences [24]. Furthermore, government and health officials provided daily updates on the virus's growth and information on how to guard against it [25].

The urgent need to conduct information systems research on social media infodemics has been highlighted by the research community [26], who highlighted that the term "*misinformation*" is unclear and imprecise. Baines & Elliott [26] introduced a taxonomy of false information examining the communicator's intention to deceive, the message and its embodied proposition.

Research on a COVID-19 information typology [27] highlighted that our understanding of risks associated with the crisis and knowledge of the situation influence the type of information created and disseminated via social media. While technology allows information to be coded, transformed, stored, and transmitted at high speeds [28], the uncertainty and temporality of crisis-related information can cause crucial problems. Crisis decision-making follows the rhythm of knowledge production in which phases of '*known*,' '*partly-known*,' '*not-yet-known*,' '*will-be-known*,' '*unable-to-know*' and '*unable-ever-to-know*' differ; this is because assessments of uncertainties and risks change constantly. From time to time, decisions must precede what is not yet known, but the decisions must be able to be reversed or corrected if the assumptions prove to be wrong.

Due to the legislative constraints and responsibilities of crisis management agencies such as health agencies, it is difficult to coordinate their decisions with the daily updated crisis information, so the 'epistemic constellation' forms a complex system that needs constant reassessment of previous situational perceptions and decisions [29]. Correspondingly, we argue that the temporal and uncertain nature of advice and crisis

communications in the COVID-19 outbreak are also significant drivers of misinformation production and the resulting infodemic.

At the same time, we understand that if government agencies fail to establish an early and regular flow of factual and trusted information in their crisis communications that this could *result in the proliferation of rumours, misinformation, and information overload to 'fill the gap' and drastically accelerate the effects of a crisis as it impacts social behaviour* [15]. Hence, further understanding of governmental crisis communication strategies is required to treat the resulting infodemic effectively. To date, researchers and government health authorities are still seeking 'treatments' for the infodemic of misinformation and the general information overload caused by social media communications.

Our study focuses on developing an understanding of social media use for combating misinformation and increasing shared situational awareness during a crisis by studying the COVID-19 pandemic as an example; examining information posted by a trusted public health authority on their Facebook channel during the early days of the pandemic; and analysing communications strategies involved in those posts.

To align with prior studies [30],[31], we focus on *falsehood* and *ambiguity* to identify misinformation in our data cleaning process. We define falsehood as the degree to which a piece of news/information concerning a real-world event is perceived to be false and ambiguity as the level of uncertainty about a piece of information truthfulness. We also identify, define, and classify the information typologies used to combat misinformation and explore how the organisational response to deal with misinformation and the nature of the event influenced pandemic response. Our study is the first phase of a larger study that investigates how health agencies use of Facebook during the pandemic affected public trust in health officials, their communications channels, and trusted shared situational awareness.

This paper is structured as follows. We firstly summarise the crisis communications literature which deals with the COVID-19 pandemic to outline the problem. Next, we explain the research approach and dataset and outline our findings and discussion. Our paper concludes by providing insights and an immediate recommendation to assist public crisis managers and decision-makers to improve their social media communication policies and practices to enhance shared situational awareness.

3 Crisis Communications and the COVID-19 Pandemic

3.1 The Role of Misinformation

The term *infodemic* has been defined by the World Health Organisation [32] as an overabundance of information about a (public health-related) crisis, some accurate and some not, in digital and physical environments that complicates the problem-solving process. The lack of a readily available solution to the COVID-19 pandemic and a lack of relevant clinical data to support successful public health communications stifled information-sharing efforts. As a result, information systems worldwide were failing to provide timely and accurate information allowing the COVID-19 infodemic to flourish and

disseminate false information [28]. Researchers intended to identify a COVID-19 crisis-related information topology and define different types of false information [27],[28].

Misinformation has been defined as false, inaccurate, or misleading information intentionally disseminated to, or not to deceive (regardless of intent to mislead). Misinformation denotes falsehoods or distorted information, which means any information that does not directly reflect the generally accepted 'true' state of the world can be considered misinformation [33].

Disinformation, instead, is a subset of misinformation and refers to false information *deliberately disseminated* to confuse or manipulate people. An infodemic may be fuelled by deliberate attempts to spread misinformation to undermine the public confidence in disaster response which can be used to advance alternative agendas of individuals or groups. Therefore, in an emergency, people struggle to find trustworthy information and reliable guidance when they need it.

The infodemic of COVID-19 misinformation can be classified into four major thematic areas, including (1) the cause and source of the disease and virus; (2) the symptoms and patterns of transmission; (3) existing treatments, cures, and prophylactics; (4) the outcome of interventions by health authorities and organisations [32].

Some examples of this misinformation from RMIT ABC Fact Check¹ include:

- "Bill Gates would use COVID-19 vaccines to track people" (FactCheck.org – 14 April, 2020) CoronaCheck #66;
- "COVID-19 vaccines are 'in violation of all 10 of the Nuremberg Codes'" CoronaCheck #66;
- "people vaccinated against COVID-19 can "shed" the virus and infect those around them" CoronaCheck #64;
- "masks are "useless" and "actively damaging to individual health and social well-being"" CoronaCheck #62;
- "Xi Jinping invented the lockdown" CoronaCheck #61;
- "PCR tests are unable to distinguish between the flu and COVID-19" CoronaCheck #76; and
- "50% of animals in Australian COVID-19 vaccine trials died" CoronaCheck #73.

Mian & Khan [34] reported that unverified sources of COVID-19 related information on social media were prevalent and even more popular compared to reliable sources like official online health channels among internet users. For instance, some false claims like "*the virus cannot survive in the hot weather*", or "*taking a high dose of chloroquine medication can protect you*", and "*consuming large quantities of ginger and garlic can prevent the virus from going viral*" were spreading faster than the virus itself. Therefore, it is essential and timely to understand how the spread of misinformation impacts effective crisis communication and the creation of shared situational awareness.

¹ <https://www.abc.net.au/news/factcheck/>

3.2 Infodemics and Crisis Response

*"We're not just fighting an epidemic; we're fighting an infodemic"*²

Tedros Adhanom Ghebreyesus, Director-General of the WHO

The spread of misinformation during crisis like an infectious disease epidemic can inhibit crisis response and hamper risk communication efforts by undermining the trust and credibility of the information source [35]. For example, the effect of misinformation about the preventative impact of white vinegar on the spread of disease caused a dramatic increase in the price of vinegar and panic buying during the 2003 pneumonia scare in China [36].

Misinformation spread has also impacted the management of the COVID-19 pandemic. For instance, even though scientists condemned and attempted to dispel the rumour that 5G lowers the immune system and helps COVID-19 to be more readily transmitted, mobile phone masts were still set on fire by an enraged public in Birmingham and Merseyside in early April 2020 [37]. Likewise, scientists emphasised that the Malaria drug, hydroxychloroquine, should not be used to treat coronavirus, but the infodemic of misinformation around the effectiveness of this drug as a COVID-19 treatment triggered its overuse and a shortage of the medicine in pharmacies.

"The spread of misinformation during an outbreak event and the fear and uncertainty of the situation can weaken the national and global response, encourage nativist narratives, and provide opportunities for those who may seek to take advantage of this moment to deepen social divisions,"; said Melissa Fleming³. Correspondingly, public health decision-makers need to find a way to mitigate this issue. Pennycooke et al. [38] stated that people share misinformation about COVID-19 because they fail to think about the trustworthiness of the information source, and they suggest that pushing people to think about the source and accuracy of information may improve their choices about what to share on social media. As a result, social media providers like Twitter, Facebook, and Weibo can decide to censor actors who spread misinformation; however, they cannot stop conspiracy theorists, liars, and trolls [39]. Furthermore, public health organisations employ information and communication technology (ICT)-enabled channels like Facebook to combat the infodemic of COVID-19 misinformation.

Adhanom Ghebreyesus, *Director-General of the WHO*, believed that in the COVID-19 crisis, fake news spread faster and easier than the virus itself. Zarocostas [40] investigated how health officials responded to the infodemic during the pandemic outbreak to ensure people were informed to act appropriately to control the disease or mitigate its impact. WHO was at the forefront of the battle against the pandemic and was also fighting against the spread of misinformation. WHO communications teams in six regional offices included social media personnel, risk communications consultants, and communications officers. WHO's Information Network for Epidemics (EPI-

² WHO Director-General Tedros Adhanom Ghebreyesus at Munich Security Conference, 15 February 2020

³ Melissa Fleming is Under-Secretary-General for Global Communications, taking up her functions as of 1 September 2019.

WIN) provides access to regular updates on accurate and easy-to-understand information on public health events and outbreaks such as the COVID-19 pandemic. A technical risk communications team and their colleagues working at WHO's Information Network for Epidemics (EPI-WIN) closely interact with Facebook, Twitter, Pinterest, Tencent, TikTok, and Chinese social media platforms to provide them with evidence-based answers to public concerns, address rumours and misinformation about COVID-19, as well as to supply timely information.

WHO has launched various messaging services in several languages and interactive chatbots by partnering with WhatsApp, Facebook, and Rakuten Viber to communicate with billions of people worldwide in their local language. WHO and the International Telecommunication Union (ITU), supported by UNICEF, requested that all worldwide telecommunication companies send text messages to billions of people who do not have access to online information to help save lives from COVID-19.

Alongside these services, the UN uses all available channels, including social media and radio, to counter misinformation and rumours; for instance, the organization's 59 UN Information Centres fight disinformation in local languages.

The UN formed a rapid response team to overcome a surge of misinformation by sharing facts and science-based evidence and is tackling the spread of misinformation by (1) producing and propagating facts and reliable information through various communication channels, (2) partnering with businesses, (3) working with media and journalists, (4) mobilising civil society to respond to the COVID-19 crisis, and (5) speaking out for rights of global citizens [41].

Priority COVID-19 communications actions for many governments around the world included (a) advising social media companies on removing contentious pandemic content (e.g., India); (b) creating special units to combat misinformation (e.g., UK, EU); and (c) criminalising malicious coronavirus deception concerning public health measures (e.g., South Africa, Hungary) [42]. It is noted that governments worldwide take various actions to counter misinformation, many of which have yet to be proven effective.

3.3 Misinformation and Public Trust

During a public health crisis, public health officials are responsible for providing trustworthy information; however, there has been little research on how the public reacts when their expectations for such information are not met. Jang & Baek [43] showed less credible information from public health organisations resulted in increased use of interpersonal networks, online news, and social media to obtain health crisis-related information. COVID-19 is spreading throughout an increasingly interconnected globe in which people are maintaining connectivity using global digital social networks, such as Facebook, to enable their interaction and information sharing about the virus [44].

During the COVID-19 pandemic, the public trust in information sources and confidence in institutions determined public response to the health measures and defined public health decisions, e.g., willingness to take up vaccines [45]. In contrast, misinformation and mistrust contributed to hesitancy and rejection of vaccinations [46]. In the

circumstances where trust in the government is critical to crisis response, communication content, type and quality are critical factors in managing a crisis. Fletcher et al. [47] showed public trust in information about coronavirus provided by the UK government decreased during the pandemic. The erosion of trust in public institutions and health crisis information drove the government in Italy (i.e., the Ministry of Health) to use Facebook to fight misinformation [48]. Our study investigates Australian public health (communication) strategies against misinformation, develops a better understanding of the factors that impact (information) content of governmental communication, to enhance social media communication capabilities in creating quality shared situational awareness (trust) during a public health crisis.

4 Research Approach

Our study seeks to better understand:

- How do local health organisations in Australia, at state levels, use social media (i.e., Facebook) content (information) and type (communication strategies) to mitigate COVID-19 misinformation propagation? (RQ1)
- How can this knowledge help to improve the development of shared situational awareness during crisis events? (RQ2)

We develop our understanding through an analysis of Australian public health agency Facebook pages by exploring post content and related public comments that were published during the early stage of the pandemic. Our analysis looked at NSW Health and the Victorian Department of Health official Facebook communications. New South Wales (NSW) and Victoria (VIC) are two of Australia's most populous states that also reported the highest number of COVID-19 cases during the first four months of the outbreak (3,045 and 1,366 patients, respectively). The NSW Public Health system is also the largest public health system in Australia. Facebook pages are one of the official channels that agencies use for public health communication. Our qualitative exploratory study allowed us to focus on the nature and content of public health agency Facebook communications during the early stages of the COVID-19 pandemic. Our approach is appropriate for exploratory research [49], allowing us to uncover operational processes [50] that are tight to the context under study aiming at development of findings to the 'how' question [51].

We randomly sampled 765 posts and their linked public comments published from 1 January to the end of April 2020 on the NSW and VIC of Health agency Facebook pages⁴. This four-month sampling window allowed us to study communications around two major events; 1) the start of the pandemic in Australia in late January 2020 and 2) the first COVID-19 peak in March/April 2020, affecting all states and territories [52]. We utilised a general inductive research approach [53] that provided an efficient way of analysing qualitative data. After a close reading of the post content, we removed

⁴ <https://www.facebook.com/NewSouthWalesHealth> & <https://www.facebook.com/VicGovDH>

posts that provided facts, news, or information that had been scientifically accepted at the time of the post. To achieve this, we conducted a thematic analysis, and unlocked insights in the data to code posts. This assisted us to "*condense extensive and varied raw text data into a brief, summary format*" and "*establish clear links between the research objectives and the findings derived from the raw data*" [53 p.2].

Finally, we further analysed the post content and manually selected 29 posts that addressed the uncertainty or unreliability of COVID-19 related information available on social media or other sources/channels of communication. We selected these posts because they address the four major thematic areas⁵ of the COVID-19 misinformation outlined in "*Coronavirus disease 2019 (COVID-19) Situation Report–85*" [32]. By doing this, we investigated how local public health organisations, employed social media to combat misinformation. Our study methodology could be further employed for similar or more complex examples of crisis communication.

Subsequently, the content of the posts was read several times to identify themes and categories, i.e., open coding. The posts were read by researchers individually, and the coding frame was developed after group discussion sessions. The posts were reread again and recategorized according to the agreed coding structure, then abstracted into a higher logical level, which, after further discussion, were conceptualised into final themes. Major themes emerged through rigorous and systematic reading and coding of post content. The themes were developed to address the research questions.

We also observed a new phenomenon during the process; the old posts containing obsolete information contradicted subsequent new 'current' knowledge, which could be considered misinformation. Consequently, a new code, i.e., *Contradictory Information*, emerged, and the coding frame was slightly changed. All posts were then reread according to the new structure. The new theme, i.e., *contradictory information*, was a significant insight and finding as: 1) this directly undermines the connection between content and type undermining the trustworthiness of the source and consequently trust in the shared situational awareness, and 2) the phenomenon has not been reported in the literature. This finding revealed a new factor shaped by the temporary nature of the crisis-related information that directly impacts social media content and thus situational awareness quality and therefore, public trust in the official channel Crisis response agencies should carefully consider this knowledge to improve the development of shared situational awareness during crisis events.

5 Findings and Discussion

Our coding revealed three official *information typologies*, i.e., misinformation, counter-information, and myth-busting information. These information typologies are described as (1) *contradictory information*, (2) *countering fabricated information*, and (3) *myth-busting cynical information*.

⁵ 1) the cause and origin of the virus and disease; 2) the symptoms and patterns of transmission; 3) the treatments, prophylactics, and cures that are available; and 4) the effectiveness and impact of interventions by health authorities or other institutions.

Our analysis also revealed how social media *communication strategies* could spread and combat misinformation on COVID-19. The public health agencies used different strategies to fight the infodemic of misinformation using Facebook. Our analysis indicates that official posts to the health agency Facebook channels: (1) *contained the propagation of misinformation by posting counter-information, or 'corrections' of these imprecise posts, as well as (2) mitigated the infodemic by posting 'myth-busting' information* related to general rumours and inaccuracies about COVID-19. However, public health agency posts also *accelerated the infodemic of misinformation* through posting imprecise information, which, as it 'aged' then became misinformation.

We now explain our findings in detail.

5.1 Connections - Information Topologies and Communication Strategies

How do local health organisations in Australia, at state levels, use social media (i.e., Facebook) content (information) and type (communication strategies) to mitigate COVID-19 misinformation propagation? (RQ1)

Contradictory Information – Infodemic Acceleration. The public health agencies used Facebook extensively to inform the public about the outbreak; however, the uncertain nature of COVID-19 impacted the consistency and sometimes the accuracy of the information that was broadcast on the channel. The organisations posted accurate information (to the best of their knowledge at the time), and then as the outbreak changed and new scientific evidence emerged, new information was published that conflicted with previous posts. Earlier posts of information and advice, therefore, became outmoded and inaccurate as the pandemic evolved. This resulted in the information and advice in later posts contradicting that which was contained in the earlier posts. Contradictory information can be recognised as misleading/fabricated information if it is still accessible on the Facebook channel. For instance, a short video with the caption: "*Should I wear a facemask to protect myself from novel coronavirus? No. Unless you are a health professional*"⁶ was published (in February 2020) to inform the audience that at that time, they did not need to wear facemasks in public. The video was watched 244K times and received 304 likes and 115 comments by July 2021 after our data collection frame. However, another post (in July 2020) contradicted the previous February post "*We strongly recommend wearing a face mask in situations where social distancing is not possible*"⁷ this post received 486 comments and was shared 502 times by

⁶ <https://www.facebook.com/watch/?v=620993142046514>

⁷ <https://www.facebook.com/NewSouthWalesHealth/photos/a.232420926957256/1349360065263331>

⁸ <https://www.facebook.com/NewSouthWalesHealth/photos/a.232420926957256/1254334428099229/>

⁹ <https://www.facebook.com/NewSouthWalesHealth/photos/a.232420926957256/1211158705750135/>

¹⁰ <https://www.facebook.com/225158094350206/posts/1234523503413655/>

other users. As at the time we were writing this paper (i.e., July 2021), the initial post was still available to the public on the channel.

Countering Fabricated Information – Infodemic Containment. From the early stages of the outbreak in Australia (i.e., January 2020), the agencies used their Facebook channel to contain the infodemic of misinformation about COVID-19. In this sense, publishing relevant information based on scientific evidence was a strategy. In doing so, the agencies published accurate, relevant, and timely information on COVID-19 to increase public situational awareness. For instance, the agencies published posts to address the rumours, and misleading information about the cures and treatment for COVID-19, e.g., "*NSW Health is aware of people self-medicating to treat COVID-19 or using medications in an attempt to prevent COVID-19 disease.*"⁸ The spread of fabricated information created a substantial life-threatening risk to public health as well as made managing the crisis more complex. This information typology and communication strategy also included posts to increase public awareness about the existence and spread of misinformation, including disinformation (i.e., information intentionally disseminated to mislead audiences). This containment strategy aims to improve both individual health literacy and community risk awareness regarding misinformation threats e.g., "*NSW Health has been made aware of a social media post that is being widely circulated warning people to ... there is no such entity as the "Department of Diseaseology Parramatta.*"⁹

Mythbusting Cynical Information - Infodemic Mitigation. When disputed or imprecise information was circulated between people on social media or other sources, the health agency posted information with a tag that there was insufficient evidence on the accuracy of the information. This was done to provide some *yet-to-be-confirmed* information to the public to address the uncertain nature of the COVID-19 outbreak. It must be remembered that COVID-19 at this stage was a newly emerging disease and that there was a great deal of uncertainty regarding the evolution and spread of the pandemic. The health agencies admitted to the uncertain nature of some information in their posts, e.g., "*According to World Health Organization (WHO) it's not certain how long the virus that causes COVID19 survives on surfaces, ..., ¹⁰" or "... people gain immunity to the virus, but because it is a new virus, we don't know how long....¹¹"*

¹¹ <https://www.facebook.com/NewSouthWalesHealth/photos/a.232420926957256/1280092618856743/>

5.2 Managing Objective-Subjective Information Tensions

How can this knowledge help to improve the development of shared situational awareness during crisis events? (RQ 2)

The spread of misinformation has been an increasing challenge in managing crises since the development of social media facilitated mass communication. The infodemic of COVID-19 information and related misinformation has created a significant threat to public health and significant challenges for health systems. We investigated how misinformation impacted official health agencies' Facebook communication with the public on the NSW and VIC Health Facebook page during the COVID-19 outbreak from January to April 2020.

This study revealed that use of social media, i.e., Facebook for emergency and crisis communication, assisted public health agencies to mitigate the infodemic by 1) posting counter information or corrections of these imprecise posts and 2) posting myth-busting information related to general rumours and inaccuracies about COVID-19 by providing scientific information to increase community health literacy. However, on the downside, it accelerated the infodemic through posting of imprecise information due to the uncertain and changing nature of the event, which, as it 'aged' became misinformation. Identifying that the very communications strategies in use to counter the infodemic were in fact, contributing to it, highlights the necessity of developing alternative, or at least, other supplementary strategies.

It is recommended that government agencies should develop communications strategies which focus on information *objective-subjective tensions* to better accommodate and deal with variations in advice to the public over time. Changing crisis conditions and impacts e.g., knowledge of the virus and its effects, access to services, government funding, vaccines and RATS, community support and leadership, social dislocation, and mental health outcomes etc. as well as public digital health and safety literacy are all risk factors in infodemic generation. It is in the interest of both government and platform providers to carefully develop and utilise platforms in a way that manages objective-subjective tensions to retain and enhance trusted shared situational awareness effectively.

As a starting point, we would suggest that the content of old posts on social media crisis communications pages need to be regularly reviewed and backward audited to detect and eliminate misinformation before it has a chance to impact public response to health advice and confidence in trusted sources of information. There is also scope to be more proactive by closely monitoring changing crisis conditions and probable impacts to better anticipate possible niche communications strategies to specific audiences. These strategies may also be useful for shaping convergence behaviours in some crisis event conditions [16].

6 Conclusions and Recommendations

The inconsistency that is created over time between the information contained within posts can undermine shared and trusted situational awareness, the channel users' understanding and expectations of trusted sources, i.e., the health agency.

While trust, credibility, consistency, timeliness, and reliability are essential characteristics for effective, persuasive health communication, we observed that the unpredictable and changing nature of the COVID-19 outbreak, as well as social media temporal characteristics, facilitated information aging resulting in the spread of inconsistent and inaccurate information. This had the potential to undermine public confidence in agencies and trusted COVID-19 situational awareness.

In the context of our study, the connection type, i.e., Facebook, facilitated the dissemination of information, but the unpredictable nature of the event as it unfolded, increased the possibility and damage caused by the infodemic of misinformation.

From our study, we conclude that social media has significant advantages when it comes to infodemic containment and mitigation by health agencies, but it can also accelerate the size and velocity of an infodemic as information ages and becomes inconsistent. Disseminating timely information during a crisis is necessary to producing accurate situational awareness at any given point in time. The COVID-19 pandemic, however, was a very uncertain and changing situation in its early stages. This fuelled informational objective-subjective tensions as the temporal characteristics of a crisis, i.e., uncertainty and change over time, presented challenges for using social media channels for crisis communications.

While these channels are effective broadcast mechanisms for current situational awareness and advice, they also retain and enable the interrogation of changing communications over time without an accompanying reflection of the changing situation at each point in time when the information is posted.

As we have seen in our study, aging social media information has the potential to become inconsistent and inaccurate, which can then accelerate an infodemic and consume valuable resources required to contain and mitigate it. It can also directly undermine communication quality i.e., trusted sources. More research is required to better understand this problem and to develop more effective social media policies and applications for crisis communications.

Our research also calls into question the definition of trusted situational awareness and how information is defined and communicated during crisis and emergency circumstances.

7 Future Research

We know that the public places trust in official information sources like health agencies when it comes to assessing crisis situational awareness [4]; however, in this study we observed that social media information and communications strategies had been involved in disseminating contradictory information. As a next stage we call for information systems studies investigating situational awareness development on other social

media platforms, e.g., Twitter and Instagram as these platforms target different audiences and may require different treatments of objective-subjective tensions of information, its impact on communication strategy and quality in developing trusted shared situational awareness.

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