2023

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10.1108/APJML-06-2021-0400
Wilk, V., Roni, S. M., & Jie, F. (2023). Supply chain insights from social media users' responses to panic buying during COVID-19: The herd mentality. *Asia Pacific Journal of Marketing and Logistics,* 35(2), 290-306. https://doi.org/10.1108/APJML-06-2021-0400

Supply chain insights from social media users' responses to panic buying during COVID-19: The herd mentality.

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Acknowledgement: This research has been funded by the Edith Cowan University School of Business and Law.

Abstract

Purpose: This study applied the herd mentality theory to explore local and global social media users' responses to panic buying across the US, UK and Australia during the COVID-19 crisis to understand the implications on operations and supply chains.

Design/ methodology/ approach: A total of 208,806 social media user-generated content (UGC) pieces were collected from Twitter in three countries – the US, UK, and Australia. The analysis of this big qualitative data was performed using machine-learning based software – Leximancer.

Findings: Positive and negative sentiment towards panic buying during the COVID-19 crisis was observed in the UGC. No significant differences in social media UGC sentiment between the three countries were found, however, differences did exist in key themes. This suggests that the focus, not the sentiment, of consumers' responses to panic buying differed across countries. Social media users follow their location-based and topic-consonant social 'herd', rather than the global 'herd'.

Research implications: This study was the first to show that social media users' herd mentality differs in a crisis. The herd mentality of social networks is dependent on factors such as the geographic location of the social network (herd), which can differ from the global herd's reaction, specifically in terms of topics evident in UGC.

Practical implications: Operations and supply chain managers need to include social media UGC analysis in their strategies in crisis management responses. The topics, not the sentiment, of consumers' responses to panic buying requires managerial actions.

Originality/ value: This is the first study to show that herd mentality during a crisis, such as COVID-19, is not unidimensional and varies according to the location of the social media network with profound implications for operations and supply chain managers.

Keywords: crisis response, user-generated content, Leximancer, crisis, big data analysis, herd mentality

Paper type: Empirical

INTRODUCTION

The global COVID-19 pandemic has strained the operations and supply chains (OSC) of many organisations, disrupted businesses across all industries, and tested crisis response strategies of companies all over the world (McMaster, Nettleton, Tom, Xu, Cao and Qiao, 2020). Remko (2020) suggests that more than 86 percent of supply chains were impacted due to COVID-19. Operations and supply chain managers, in particular, have been left urgently looking for ways to better understand the rapidly changing marketplace and consumer demands, in order to reconfigure their strategies, build resilience, optimise operational resources, and ensure longevity for their businesses (Remko, 2020). Insights from big data consisting of content generated by 4.55 billion active global social media users could enable OSC organisations to expediently and effectively respond to the situation (Chehbi-Gamoura, Derrouiche, Damand, and Barth, 2020). User-generated content (UGC) analysis can offer rich insights into what and how consumers think, feel, and behave in the marketplace (Naeem and Ozuem, 2021). Such insights provide key information pertinent to responses to changes in consumer trends (e.g., Guan, Lau, Yang, and Ren, 2021; and Palalic, Ramadani, Mariam Gilani, Gërguri-Rashiti, and Dana, 2021). This was observed in share markets and promotions of companies' engagements in corporate social responsibility (e.g. Nisar and Yeung, 2018). However, UGC insights have not been widely used in OSC despite its implications for business-related decisions.

UGC, arguably, has the potential to be leveraged for responding to changing OSC dynamics. Twitter, for example, offers a quick glimpse into developing issues which can help to finetune corporate responses to unfolding crises (Naeem and Ozuem, 2021; and Chae, McHaney and Sheu, 2020). This notion is further emphasised by Sharma, Adhikary and Borah

(2020) who analysed Twitter data posted by NASDAQ 100[1], and later concluded that there is a 'dire need for a dynamic response' from the companies in the supply chain during a crisis. This dire state is compounded by a swarm of concerted consumer actions that collectively move as a single herd unit (Naeem and Ozuem, 2021).

Panic buying is a type of herd behaviour and occurs when consumers collectively buy unusually large amounts of a product, which was observed during the COVID-19 pandemic resulting from anticipated price increase and supply shortages (Lufkin, 2020). The behaviour is said to be influenced by individuals' perception of threat to the supply chain and scarcity of products (Yuen, Wang, Ma and Li, 2020). It is also characterised by the fear of the unknown, leading to, or caused by, emotional pressure and uncertainty. Panic buying serves as a venue to relieve anxiety and regain control over the crisis. This *herd mentality* is often of interest to businesses in better understanding the changing consumer trends affecting OSC. Consequently, it is of value to examine the occurrence of herd mentality in UGC for insights relevant to the OSC.

In the context of OSC management, emerging digital technologies are still under-utilised and receive little scholarly attention (De Giovanni, 2019; Dwivedi et al., 2019; and Koh et al., 2019). These technologies can assist organisations in their planning, mobilisation of assets and production capacity, and in the management of emergency situations (De Giovanni, 2019; Dwivedi et al., 2019; and Koh et al., 2019). This study, therefore, attempts to address some gaps in extant research and contributes to industry and scholarly knowledge in the following ways.

[1] NASDAQ 100 is a pool of the largest, actively traded 100 companies on the Nasdaq stock market in the United States.

First, this research investigates social media UGC about panic buying during the COVID-19 crisis across three countries – the United States (US), United Kingdom (UK), and Australia (AU). The co-creation of information through UGC which underpins social media networks, presents insights into the rapidly changing marketplace conditions and consumer behaviour. These changes affect the OSC around the globe, as shown in the work by Choi (2018) and Wang et al. (2019). The country-level comparison provides information about consumer sentiment and supply-related insights which can be used by OSC managers to align their strategic and tactical approaches. While the crisis is global, country-specific variations provide additional business intelligence allowing companies to tailor their responses that resonate with consumers' concerns.

Second, the study is based on big data sourced from real social media UGC, where studies in the OSC management literature are limited (Song et al., 2021; and Tseng et al., 2019). Specifically, our study uses machine learning-based qualitative data analysis program – Leximancer, which has not been widely used in the OSC context. In doing so, we showcase how qualitative big data from social media can provide practical insights, using lexical analysis driven by machine learning algorithms.

Third, this research investigates the phenomenon through the lens of *herd mentality theory* (Loxton et al., 2020) to generate attitudinal and behavioural insights from social media users' online exchanges. Unlike in other fields, such as finance (e.g., Dang and Lin, 2016) and psychology (Li et al., 2020; and Zhang, 2020), the herd mentality theory has only recently been applied in the supply chain context as demonstrated by Huo et al. (2020). These researchers investigated a mathematical model of risk propagation in the OSC context, where they highlighted the strength of herd mentality. Guo et al. (2020) also noted that the theory has not been well applied in the OSC. The sections that follow introduce the literature which underpins this study.

LITERATURE REVIEW

User generated content, emergency situations and their impact on the supply chain

A crisis, such as the COVID-19 pandemic, can have catastrophic effects on the OSC (Govindan et al., 2020). As observed during the pandemic, such disruption requires immediate and effective actions to minimise impact on businesses (Govindan et al., 2020). Surprisingly, shortages of goods were not entirely caused by production capacity; rather, the disruption in transportation was the key issue (Xu et al., 2020). Demand increased substantially for certain items, such as, medicines and medical equipment, personal protective equipment, and ventilators. However, the supply of these items was affected by international logistics due to cancelled flights, unavailable labour, trade restrictions and boarder closures (Xu et al., 2020). For example, India, the world's largest rice exporter, postponed its exports because of the lack of labour and logistics problems (Jadhav and Bhardwaj, 2020).

At a time of crisis, the procurement team may experience immediate pressure to find products and reliable suppliers, and to secure the best price to meet the demand surge. Historically, these tasks were designed to optimise competitive advantages of an organisation through globalisation, offshoring and lean-based efficiency (Sarkis, 2021). As a result, the production of products are located in jurisdictions far away from the end-consumer. Subsequently, OSC managers often use traditional quantitative forecasting using past data to forecast demand. This approach works well in a relatively stable environment. However, in a sustained demand surge period, real-time data are required.

Such real-time data is rich in valuable insights and can be harvested from user-generated content (UGC) where consumers, suppliers, retailers and other intermediaries, share and co-create their opinions, feelings and behaviours (Cheung et al., 2021). Qualitative

unstructured data is useful in uncovering meaningful and deep insights, as they are mined from authentic online exchanges (e.g., Wilk et al., 2021a, 2021b).

Subsequently, social media analysis is useful in understanding changes in the marketplace and in consumer profiles (Beheshti-Kashi, 2020). UGC analysis has been found to offer meaningful business insights. For example, Wilk et al. (2021a) showed that consumers are able to advocate for brands and influence purchase behaviour of others. UGC offers opportunities for companies to better understand panic buying phenomenon during the COVID-19 pandemic.

Insights from the lexical analysis of UGC are imperative for OSC managers in responding to crisis-affected supply and logistics dynamics. Such insights allow managers to make swift decisions by better understanding the structural characteristics of their extended network (i.e., consumers and other stakeholders) which will help to shape their supply chains to be more adaptable to unforeseeable changes (Wichmann and Kaufmann, 2016). The insights also offer better risk evaluation and identification of opportunities in complex supply chains (Choi et al., 2015). Such understanding contributes towards building resilient and agile supply chains which can improve firm's financial performance (Li et al., 2017).

Herd mentality theory and social media user-generated content (UGC).

A typical consumer trend analysis involves traditional forecasting methods using historical data. Such traditional methods are not agile in anticipating or responding to demand changes. More precisely, these methods do not take advantage of the insights offered by social media analysis which uses real-time, authentic UGC. Subsequently, resilient OSC can be built based on real-time sensing of consumer trends (see Sarkis 2021). Li (2011), for example, argued that social media could improve information latency in supply chains and is able to improve stakeholder (re)actions throughout the chain. Such an advantage is feasible because

UGC contains information about consumer sentiment and key topics of interest. Therefore, UGC is a vehicle for the propagation of public sentiment, characterised by its polarity – either positively or negatively oriented. With enough mass, existing sentiment helps to reinforce itself, making one perspective dominant over the other (Nagarajan, 2010). In a situation where quality information is limited, consumers tend to rely on others when making decisions. This is particularly prevailing when the information sought after is related to severe events, as individuals psychologically gravitate towards negative news, rather than positive content (Kumar et al., 2018). This negative bias was observed by Trussler and Soroka (2014) where eye-tracking data o suggested research participants leaned towards negative cues.

News reports show that in an anticipation of a complete country lockdown during the initial phases of the COVID-19 pandemic, demands spiked for groceries and home-office equipment (Masige, 2020; and Powell, 2020). Such panic buying resulted in empty shelves in supermarkets and frustrated consumers. These consumers then took to social media to express their disappointment. The #coronavirus hashtag was, for some time, a top trending topic on Twitter (Twitter, 2020a). The supply chain disruption, shortages at supermarkets and the panic buying behaviour were evidenced through heavy media coverage on the topic and through #toiletpapergate, which was another key trending hashtag on in March 2020 (Twitter, 2020c;Lazzaro and Nobel, 2020; and Mark, 2020).

Given the nature of the pandemic, unmoderated social media UGC (Zubiaga et al., 2018) inadvertently induced irrational behaviour resulting in the panic buying phenomenon reported in many countries. Some researchers (e.g., Loxton et al., 2020) found that consumer behaviour during the crisis appeared similar to behaviours exhibited during historic shock events, such as, the 2002-04 SARS outbreak, the 2011 Christchurch earthquake and 2017 Hurricane Irma. Such behaviour is known as *herd mentality*, where people communally act in a similar way without properly deciphering what the situation really entails (Dang and Lin,

2016). Herd mentality is a self-fulfilling prophecy and can lead to a 'tragedy of the commons' (Hardin, 2009), where every actor will be worse off when panic buying overtakes the fundamental extension in morality.

Herd mentality, or collective (re)action, amongst consumers can lead to genuine product shortages regardless of whether the risk of a shortage is real or perceived. Subsequently, it can result in anxiety and irrational behaviour (Sherman et al., 2021), putting pressure on the OSC across the world (Lufkin, 2020; and Yuen et al., 2020). Broadly speaking, the herd mentality theory embodies two concepts: *discounting own information* and *imitating others* (Sun, 2013). Discounting own information happens when individuals put others' opinion over their own, while imitating is a series of processes where individuals observed others' actions through peripheral cues which eventuates in the same course of actions (Xu and Warkentin, 2020). Anecdotal evidence on social media during the pandemic illustrated this very phenomenon.

Studies have applied the herd mentality theory to better understand consumers and stakeholders. The use of the theory has been demonstrated in information technology (Sun, 2013), politics (Pedersen et al., 2021) and online consumer behaviour (Klein and Sharma, 2022). Subsequently, this theory can provide a lens through which we can understand consumers' reactions to panic buying during the COVID-19 pandemic and draw meaningful insights which will assist OSC managers in effectively responding to the shocks in the marketplace.

Therefore, this research seeks to answer these questions: to what extent does herd mentality evidence itself in UGC? Are there any differences in the herd mentality of social media users across countries? And, what implications might such UGC have on the operations and supply chains globally?

METHODOLOGY

Big data analytics of social media content can assist OSC managers in decision making (Dubey et al., 2019; Ghani et al., 2019; Matthias et al., 2017; and Ramanathan et al., 2017). This exploratory study applied qualitative, lexical analysis driven by a machine-learning algorithm in Leximancer. A qualitative method is considered suitable in the context of this study, given the nature of the unstructured, big data derived from UGC. This study follows methodology illustrated in Wilk et al., (2018, 2019, 2021a, 2021b), Morgan and Wilk (2021a, 2021b); and Willson, et al., (2021).

Sample

Twitter UGC has been used in research across a variety of disciplines. For example, the platform was used in studies about consumer behaviour (Naeem and Ozuem, 2021), tourism (e.g. Ćurlin et al., 2019; Bigné et al., 2019), sport (e.g., Morgan and Wilk, 2021a, 2021b; Morgan et al. 2021), marketing (e.g., Wilk et al., 2021), and supply chain (e.g., Sharma et al., 2021). As Barbagallo, Bruni, Francalanci and Giacomazzi (2012, p. 507) noted, *"content is even more central in micro-blogging (such as Twitter), as the shortness of messages compels users to focus on the core of the information that they want to share…. encourages users to produce contents that are easy to consume",* supporting the use of Twitter in academic studies.

Subsequently, this study harvested data from Twitter over a three-month period from 29 January 2020 to 28 April 2020 using Salesforce Social Studio. This period was chosen as these were months when the impact of the COVID-19 crisis started gaining momentum (Deloitte, 2020; FAO, 2020; GRFC, 2020; The New York Times, 2020; Twitter, 2020b). This observation window identified 208,806 tweets with #coronavirus (hashtag) and 'supply' (keyword). These tweets were categorised by country of interest – Australia (AU), the United

Kingdom (UK), and United States (US) – and by positive and negative sentiment. This process resulted in 115,879 posts, with 64% originating in the US, 29% in the UK, and 8% in Australia. The sample size difference did not affect the lexical analysis, as country-by-country analysis was performed separately (Wilk et al., 2019, 2021a, 2021b; Morgan and Wilk, 2021a, 2021b; Willson et al., 2021).

Qualitative Analysis

Thematic content analysis is a method for identifying, analysing, and reporting patterns (themes) within data (Braun and Clarke, 2006). Recent studies based on unstructured UGC data (e.g. Wilk et al., 2019, 2021a, b; Morgan and Wilk, 2021a; Willson et al., 2021) have used machine learning based programs, such as, Leximancer for impartial, computer-driven thematic analysis (see Angus et al., 2013).

In the context of supply chain management, Kim and Kim (2017) used Leximancer to investigate sustainable supply chain management (SSCM) trends concerning sustainability in the textile industry. Further, a study by Aryal et al. (2018) used Leximancer for a systematic review in the emerging big data analytics and Internet of Things (IoT) in supply chain management.

In the current study, separate lexical analyses were conducted on each sentiment type with tags for each of the three countries (Figures 1 and 2). This approach provided a comparative visual overview of country-level sentiment illustrated in a Concept Map. Further, the Prominence Scores (PS) for key concepts were also examined, in order to enable an interrogation of unique country-level differences. A PS of 1 or more was deemed satisfactory for single concepts and a PS of 3 or more was deemed ideal for compound concepts (Wilk et al., 2019, 2021a, 2021b).

RESULTS AND FINDINGS

Positive sentiment comparison by country

Positive sentiment is evident across all three countries. The most prominent themes in UGC with positive sentiment were *Panic Buying*, followed by *People*, *Hoarding*, *Panic Shopping*, *Idea*, *Social Distancing*, *Toilet Paper*, *Politics*, and *Kindness* (Figure 1). The three countries differed in the hashtags featured in the UGC. For example, UK users included #lockdownUK, #toiletrolls, #bekind and #panicshopping; while Australian users used #auspol (Australian Politics), #toiletpaperpanic, and #panicbuying; and in the US, #votebluenomatterwho, #staysafe, #stayathomechallenge, and #stayhome were used. The hashtags seemed to link UGC to different or similar topics of online narrative and represented the online community traits and interests (see Chae, 2015). From the OSC perspective, these keywords can be used for a targeted approach to reach consumers. The similarities and differences of UGC are presented in more detail in the following sections.

UK social media content

In the UK, users shared about online resources, such as a website (PS 1.9) with information about outlets and useful sources, to assist others and to curb panic buying (PS 1.7) and stockpiling (PS 1.7). For example:

> "Great website listing of independent producers, suppliers, restaurants and retailers with info about what is available to buy and how you can buy it from them... Beat #panicbuying."

UK content also included a light-hearted spin on consumers' panic driven shopping behaviour. For example:

> "So if you want to watch any racing or wrestling in the near future, may I recommend going to any supermarket aisle selling toilet paper or any essential items? #coronavirus #COVID19 #Olympics2021 #panicshopping #panicbuying."

US social media content

Positive US content used humour to encourage rational thinking in shopping behaviour. A humourous online video depicting an elderly lady pushed away by a businessman from taking a pack of toilet rolls went viral. This contributed to online discussion on the topic of #panicbuying as it brought focus on the ridiculous behaviour witnessed by many at supermarkets. For example:

> "Why is stocking up toilet paper more important than food? Water is more sanitary and cleans the area well.".

Further, US shop owners shared about product availability and encouraged people not to panic buy. For example:

> "Here is a video from our local grocery store in SF Bay Area California. we are not running out of food!"

This was also supplemented by users' reminding others about plentiful supply. For example:

> "REMINDER: there's no need to overbuy food during the #COVID19 pandemic! …they have plenty of groceries in their supply chains…Stop #panicbuying, keep calm and buy only what you need!"

US users also shared support for supermarket staff in enforcing purchase limits. For example:

> "Kudos to staff at …supermarket that wouldn't let a woman with a shopping basket full of toilet paper hoard so many rolls. They said she could buy two big packs and made her put the rest back on the shelf for other customers. #panicbuying #COVID19".

Australian social media content

Positive Australian content evidenced support toward essential workers to access food and necessities, as well as urging people to stay calm as there was adequate food supply. For example:

> "ppl are STILL hoarding but the supermarket has dedicated 2 new shopping windows to health workers so they can actually eat after a long shift of saving lives." And "Keep calm avoid #panicbuying there is adequate food supply in our country."

Social media users praised the Australian government for managing the panic buying behaviour. For example:

> "This is very good from Australia's Prime Minister… who (in his most recent address to the nation), called out #panicbuying which he described as ridiculous and unaustralian. #covid19australia #Covid_19 #auspol".

Australian UGC also celebrated successful purchases of hard-to-find items. For example:

> "Somehow I feel like I won the lottery this morning…It's not my usual double length, but who cares? The fact is, it's functional and it's here, and that's all that really matters. #toiletpaper #Canberra #Aldi #panicbuying".

Essential workers, including truck drivers, were also visible on social media. Often, their tweets were re-tweeted to educate and encourage support, highlighting how important these stakeholders are in the food supply chain. For example:

> "Please be KIND to your local supermarket checkout operator. We're NOT limiting you to 2 tins of vegetables, 2 milks, 1 pack eggs etc to ruin your day. We're following strict instruction."

> "Give our truck drivers a wave...They might 'toot' back #WithoutTrucksAustraliaStops #PanicBuying #PanicShopping #Coles #Woolworths # IGA #Aldi #covid19australia"

There were also support for local outlets and retailers, in particular for small businesses. For example:

> "Don't worry, Australia ain't running out of beer! So stop the #panicbuying and instead support your local breweries…. have started online sales now."

The Australian users also propagated news updates on the retail situation and experts' opinions on the supply chain. For example:

> "Supermarket spend up 40% in the week ended March 16 compared to the same week last year. Retail to go up in March. #Panicbuying to ease in coming months, as people become used to the new normal of social distancing."

<Insert Figure 1 here>

Hashtags used in the UGC assist OSC managers to identify trending topics on social media. Positive sentiment embedded in the narrative surrounding shortages gave managers the context for the arising issues. As shown in Figure 1, the themes do not exist in isolation. Rather, they are connected to each other either directly or through other themes. This information allows managers to plan for a targeted approach to connect with consumers. For example, the positive sentiment seen in Australian UGC encouraged strict adherence to the buying limits and, potentially, contributed to lifting the pressure felt by supply chains. OSC managers can echo this sentiment by using similar hashtags and referring to the arising UGC themes, to better connect with the consumer community, subsequently, moderating consumers' demand and thus easing pressure on the supply chains.

Negative sentiment comparison by country

Negative sentiment is evident across all three countries. The themes which appeared across all negative content were *Hoarding*, *COVID-19*, *Supplies*, *Stores*, *Response*, *People*, and *Sell* (Figure 2).

UK content

UK content with negative sentiment focused on Hoarding, COVID-19, and Sell. Social media users commented about supermarkets (PS 1.4), selfish (PS 1.4), and critical (PS 1.3). More specifically the narratives are about selfish #stopstockpiling (43.0), hoarding #stopstockpiling (PS 29.5), and selfish prices (PS 29.5). Medicine and care products were interest. For example:

> "#panicbuying really needs to stop, first it was a joke with the toilet paper but now its basic food and medicine"

> "#handsanitiser,#coronavirus,#covid19uk,#carex,#panicbuying"

US content

US content with negative sentiment focused on themes of *People*, *Response*, and *COVID-19*. UGC included commentary about #stayhome (PS 1.7), store (PS 1.5), toiletpaper (PS 1.3), hoarding (PS 1.1), and empty shelves (PS 1.1). For example:

> "In response to the #COVID19 crisis, some have resorted to a much more dangerous form of #PanicBuying: stockpiling guns."

> "The LA Times calls it the "unravelling". Scenes of violence and panic on global coronavirus fears #CoronaVirusUpdate #panicbuying #coronavirus #SupplyChain #COVID19"

Australian content

The themes of Australian content with negative sentiment were *Supplies*, *Stores*, and *COVID-19*. UGC commented on the herd mentality of Australians (PS 15.0), behaviour at supermarket (PS 4.4), toilet paper (PS 1.5), and empty shelves (PS 1.2). Expression which often appeared on the social media were Australians idiots (PS 1554.7), Australians #auspol (PS 915.3), and #covid19australia Coles (PS 240.3). The narrative included specific products, such as bread, pasta, baked beans, water, and baby care. For example:

> "Look there wasn't bread at the supermarket but there were raspberry lamingtons. They're a breakfast food now. #panicbuying #covid19"

> "Got toilet paper (1 packet). No sanitiser. No loaf bread!!!! Got 1 packet of flour…not #panicbuying #COVID19Aus"

> "#panicbuying has been #RICE #PASTA #BAKEDBEANS and other canned goods"

Interestingly, there were users who commented about similarities in panic buying between the 3 countries – UK, US and Australia. For example:

"Why are we seeing #panicbuying mainly in UK, Aus and US? Do we share some selfish gene? Or do we subconsciously know our food chains aren't #sustainable?"

<Insert Figure 2 here>

Although, both sentiment types were present across the three countries, the negative sentiment content was more profound, in particular, about the unsustainability of supply chains. Negativity was primarily driven by the frustration about not being able to get required products (in the UK and Australia), and insecurity as shown in the tweets from the US. Naturally, individuals gravitate more towards negative news, which could have contributed to such a response. A similar phenomenon was also observed by Schmidt et al. (2020) in their study on the share market reactions to supply chain glitches. These authors demonstrated how social media elevates the prominence of disruption in the OSC context. Schmidt et al. (2020) also argue that companies can leverage Twitter to counteract the shock in the financial investment landscape and influence consumers, following supply chain interruptions.

The three countries studied were also different in the actual themes and concepts that reflected key topics of narrative. Australian UGC dominated discussion about Coles, a large supermarket chain, (positive sentiment compound concept PS = 983.4, negative sentiment compound concept PS = 240.3). In comparison, overbuying, store, and stocking, were the key topics of interest in regards to OSC in the US (positive sentiment compound concept PS = 52.5, negative sentiment compound concept PS = 58.5). In comparison, supermarkets, sell, and hoarding dominated the UK content.

In terms of specific products, US users resorted to stockpiling guns thus putting pressure on gun and gun-related products supplies, while medicine and care products were of concern in the UK; and food staples such as bread, pasta, and water were dominant in Australia.

DISCUSSION, IMPLICATIONS AND LIMITATIONS

This study investigated social media UGC about panic buying during the early stages of the COVID-19 pandemic across the US, UK and Australia. Through the lens of herd mentality theory and application of big data analytics, the lexical analysis allowed a deep understanding of the rapidly changing marketplace dynamics. This study took a 'snapshot in time' approach to explore UGC relevant to the phenomenon of interest.

The herd mentality behaviour can cause anxiety (Singh and Misra, 2020), and during COVID-19, had led to panic buying which affected the availability of products. Social media users often shared news with their online networks about essential items being out of stock, urging consumers not to hoard or sell sought-after items at inflated prices on the secondary market. Stories of panic-stricken consumers were shared across all three countries, putting a spotlight on irrational behaviour at the supermarkets. At the same time, praises were also given to supermarkets for limiting purchases of essential items.

Despite some differences in how each country deals with COVID-19 (e.g., nation-wide lockdowns, hard border closures, or localised lockdowns), and the differences in the severity of the pandemic, our observation leads to a conclusion that social media users reacted very similarly to the crisis in terms of sentiment but not in terms of the topics, thus partially supporting the herd mentality theory. Sentiment-wise, the data is consistent with the global herd mentality proposition but deviates in the topics discussed. The topics were location-specific, thus differed across the three countries. This pattern was visible in both online (in what they said in their UGC) and offline (in what they reported they or others did offline) behaviour.

OSC managers and organisations can take advantage of these findings to be better able to manage their stretched supply chains. It was evidenced that social media users urged others

not to hoard or panic buy. This element was not reported in prior research nor in the news outlets (e.g., Lufkin, 2020). Despite relentless negativity and the severity of the pandemic reported in the media, it was found that social media users shared positive sentiment about supplies during the early stages of COVID-19. Social media users were able to regulate the evident sentiment despite the overwhelming negativities. Notably, *protecting the frontline workers* theme emerged in the UGC, indicating that erefore, the authorities should emphasise messages that promote empathy towards the frontliners. This was seen in the UK, where "Protect NHS" slogan (NHS = National Health Service) was always visible on every official COVID-19 news conference.

We also found UGC linked politics, the government and the pandemic. The anticipated 2020 US presidential election gained social media coverage and could have impacted the COVID-19 panic buying related sentiment in the US. A similar pattern was also observed in Australia where the Australian UGC often featured #auspol (Australian politics).

As highlighted in the findings, regardless of the country of residence, digital connectivity shines a spectrum of 'herd mentality' at the outset of COVID-19. Social media users seemed to mimic online narratives found in UGC and with enough volume, through herd mentality, such UGC can gather sufficient mass to affect the supply of everyday items. This is in line with Huo *et al.* (2020) who posited that some decision makers will imitate surrounding entities' behaviour because of their lack of experience, leading to the "incoordination of the whole supply chain resulting in more serious risk" (Guo et al., 2020, p.4). Subsequently, every player in the chain (manufacturer, distributor, retailer, seller, and consumer) is worse off when panic-stricken consumers over-purchase and hoard essential items, that is, when panic buying overtakes the fundamental extension in morality, leaving empty shelves in the supermarkets.

The pandemic created vast disparities between supply of goods and the surge in demand (Remko, 2020). Shortages resulted from the supply chain being under stress and unable to cope with unprecedented demand (Paul and Chowdhury, 2020b). The situation was aggravated when authorities around the world put extensive measures to contain COVID-19, halting production and disrupting logistics.

In responding to a shift in supply and demand due to the occurrence of unexpected disruptions and uncertainties, OSC resilience is critical. This can be achieved through cross-functional processes and transparent information sharing (Saddikuti et al., 2020). A transparent OSC can create a network of multiple partners who enter into collaborative relationships of information sharing and trust, to remove barriers and achieve supply chain visibility (Wang and Jie, 2020). Together with firms' response capacity (Shashi et al., 2020; Xu et al., 2020), visibility can contribute to the OSC resilience.

In order to create high visibility and high responsiveness to the OSC disruption, organisations need to prioritise planning and forecasting (Xu et al., 2020). These can be achieved through digital sensing, such as capturing and analysing geospatial patterns and themes evident in UGC. The cross-country comparison in this study shows key topics that resonated among residents in each country. This real-time information can be used by the OSC managers to craft effective responses that reverberate well with consumer sentiment.

In line with prior studies (Sharma et al., 2020); Xu et al., 2020), our findings point to an emphasis on the diversification of suppliers to guarantee uninterrupted supply. Diversification creates an agile supply chain that can quickly reconfigure if the market dynamics move (Sharma et al., 2020; Remko, 2020). Operation-wise, substitute sourcing and inventory redundancy can also allow for a quick recovery (Worstell, 2020; Xu et al., 2020).

These strategies assist long term planning to reduce the risk of disturbances due to a calamitous event (Manning and Soon, 2016; Paul and Chowdhury, 2020a; Xu et al., 2020).

The cultural, political, economic, and language similarity between the three countries studied is acknowledged (e.g., Hofstede's Culture Compass: https://www.hofstede-insights.com/product/compare-countries/). These similarities allow for suitable comparison of UGC between countries. However, the cultural and language similarity may also be seen as a limitation, which presents an opportunity for future studies to explore. Further, this study focused only on Twitter UGC, thus, future research can investigate the present topic by exploring UGC from other online sources such as online groups or quantitative methods such as online surveys.

CONCLUSION

This study explored the extent of herd mentality evident in social media user generated content (UGC) responses to panic buying during COVID-19 in three countries – the UK, US, and Australia. Big data analysis was performed with a machine learning based program – Leximancer - to uncover thematic patterns in Twitter UGC. By applying the herd mentality theory and comparing the three countries' UGC on sentiment and key themes of discussion, this research contributed to a better understanding of supply chains during the COVID-19 crisis.

This study found differences in the topics (themes), not the sentiment, found in social media users' responses to panic buying during the pandemic. It seems that the online community follows their local herd which is topic-consonant, rather than the global herd, which is sentiment-consonant, at a time of crisis. This has implications for OSC managers, as both the sentiment and the topics of online narrative found in UGC provide insights into a fast changing and crisis-stricken marketplace. Social media analysis can yield intricate details about

consumer trends and the evolving marketplace and thus should not be underestimated by OSC managers. Future studies in this context are encouraged.

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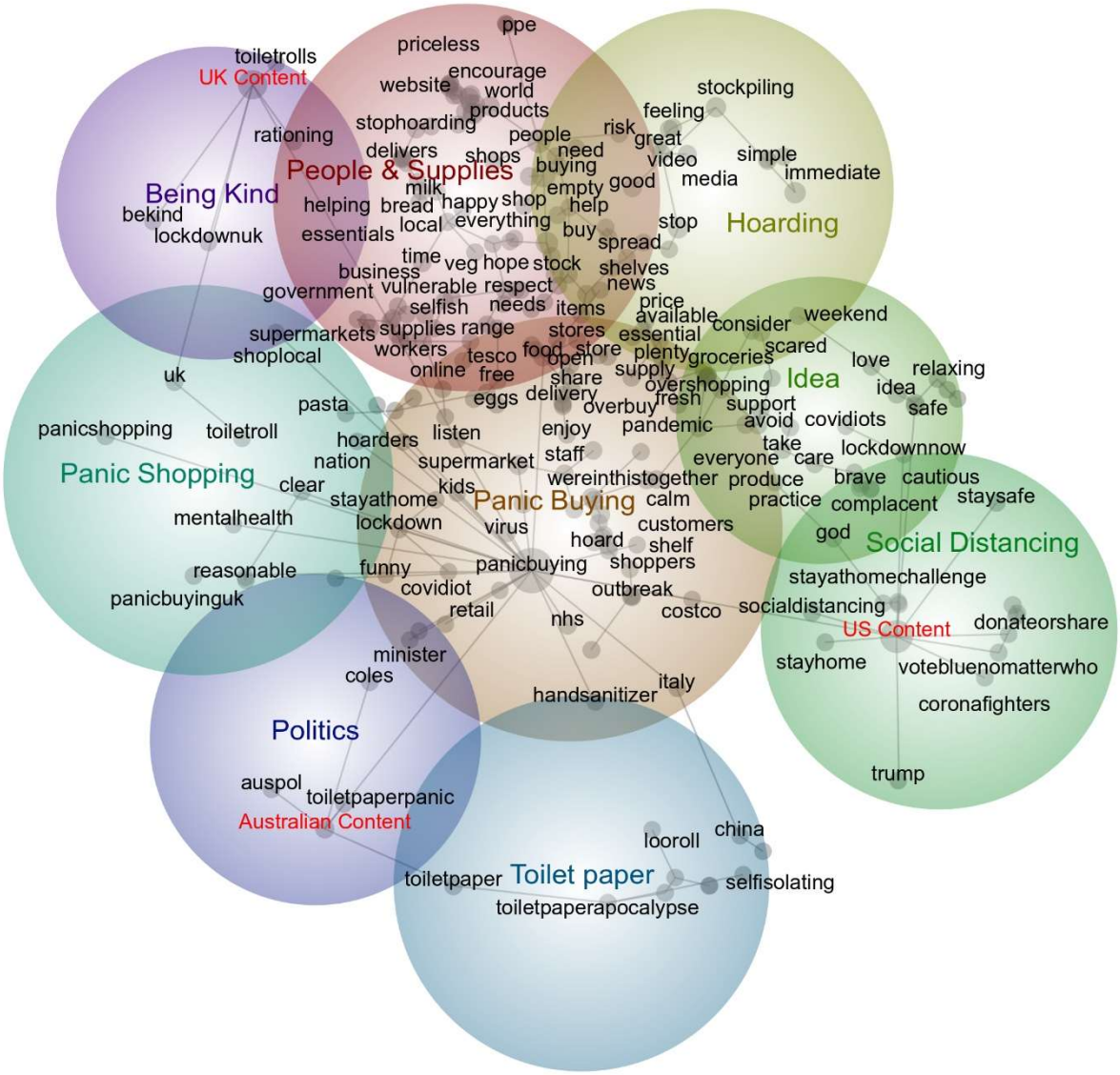
Figure 1: Positive sentiment comparison by country (Source: Leximancer Concept Map)



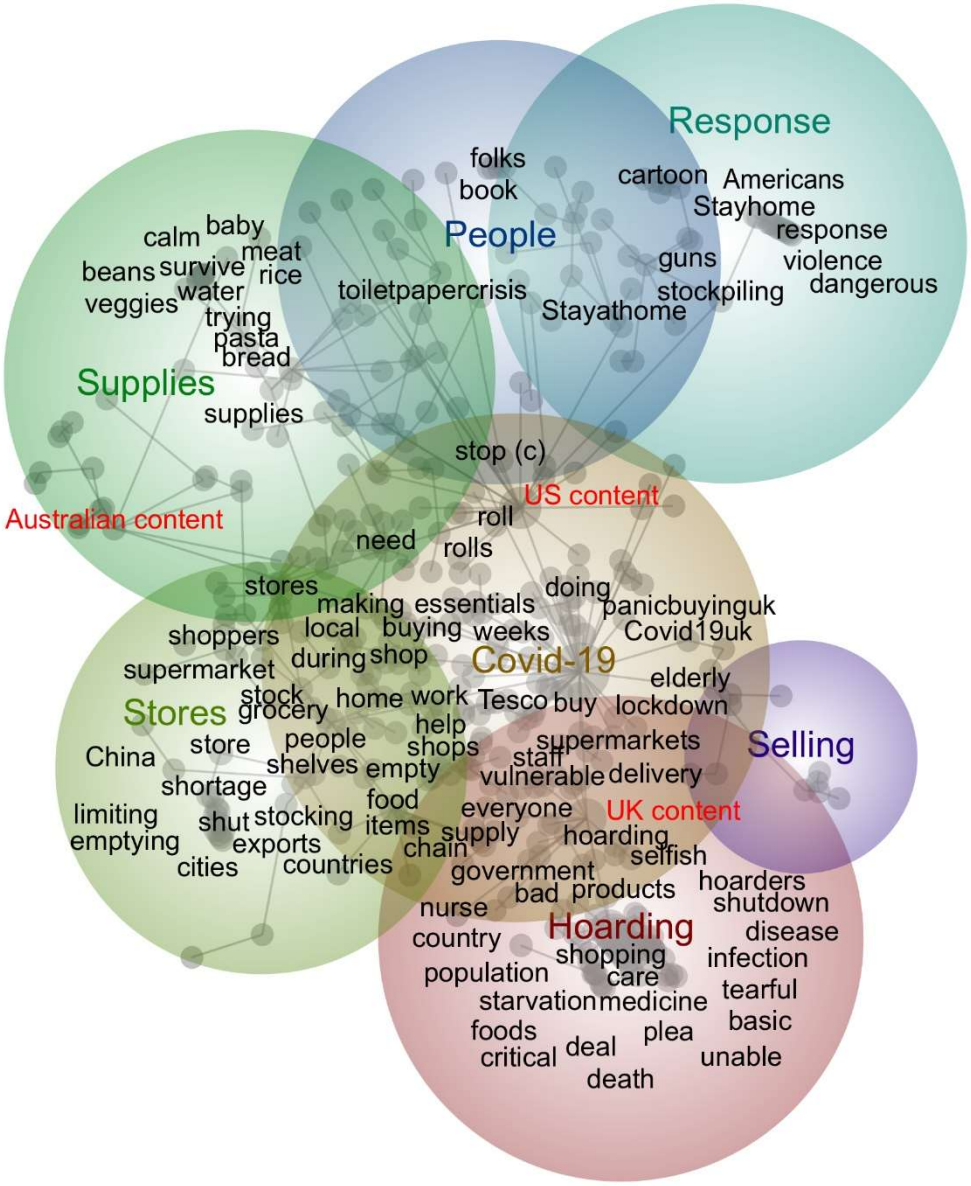


Figure 2: Negative sentiment comparison by country (Source: Leximancer Concept Map)