UPPSALA
UNIVERSITET

Department of Informatics and Media

Master's Programme in Social Sciences,

Digital Media and Society specialization

Two-year Master's Thesis

How to Shoot a Virus (With) a Message:

A study on the usage and effect of coronavirus messages on Weibo

Student: Wei Chao

Spring 2020

Abstract:

This study investigates what roles the Chinese state-owned media play in the Covid-19 outbreak in terms of what kind of messages they delivered on Weibo and the quality of the messages. It also explores how the public is engaged with these messages on Weibo. Both the messages and the engagement are examined by a mix-method content analysis.

The exploration of the Weibo messages relies on the Crisis and Emergency Risk Communication (CERC) framework. The CERC framework combines various existing theories and compiles them into a communication guideline for a health crisis. This study examines the messages by focusing on sensemaking and self-efficacy. Sensemaking is informing the public of the nature of the crisis; self-efficacy reflects people's confidence in the capacity to change behaviours and deal with the problems. It was found that Weibo provides a platform for delivering sensemaking messages and self-efficacy messages in the coronavirus outbreak. However, considering the accuracy, relevance and intelligibility of strategic health communication, the quality of the messages is debatable in some cases.

The exploration of social media engagement relies on Liu, Lu and Wang's virality theory on social media which discusses four aspects of engagement: authority, privacy, evidence and incentive appeal. This study shows how each of these aspects influences how people engage with messages on Weibo: the effect of different authorities on the message engagement; the usage of one-to-one communication and one-to-many communication in the engagement; and the engagement in positive appeals and negative appeals.

Keywords: health crisis communication, Coronavirus, social media messages, sensemaking, efficacy, social media engagement, Crisis and Emergency Risk Communication Framework, message virality

Table of Contents

Acknowledgment **4**

1. Introduction **5**

1.1 Setting the Scene 5

1.2 Aims and research questions 6

1.3 Relevance and contribution to the field 8

1.4 The actors on Weibo 10

1.5 The COVID-19 outbreak in China 11

2. **Literature Review** **12**

2.1 Mobile health 13

2.2 The effect of social media on mass media 14

2.3 Social media as a health communication tool 16

2.4 Two case studies 18

2.4.1 The usage of social media by public health organizations during Ebola 18

2.4.2 A H7N9 case study based on the CERC framework 20

3. Theoretical framework **21**

3.1 Risk Communication and Crisis Communication 22

3.2 Crisis and Emergency Risk Communication (CERC) framework 24

3.2.1 What is sensemaking? 25

3.2.2 What is self-efficacy? 26

3.3 Social media engagement 27

3.4 Virality on social media 31

4. Methodology **33**

4.1 Case Study 33

4.2 Using API for the data collection on Weibo 34

4.3 Analysis of the posts 36

4.4 Analysis of social media engagement 40

4.5 Reliability 41

4.6 Validity 42

4.7 Limitations 42

5 Results and analysis **43**

5.1 A brief overview of the results: Social media as a medium for sensemaking and efficacy 43

5.2 Sensemaking messages 50

5.2.1 A small number of the messages placing the crisis in a framework 50

5.2.2 Comprehending the situation - the accuracy of statistical data 51

5.2.3 Vaccine and treatment development messages - the importance of intelligibility 53

5.2.4 Refute non-factual information messages - the relevance to the virus 55
5.3 Efficacy messages 57
5.3.1 Disease control instructions and daily life advice - familiarity breeds trust 57
5.3.2 Travel advice 59
5.4 Social media engagement 60
5.4.1 Authority and cognitive demand 61
5.4.2 Privacy end evidence 62
5.4.3 Incentive appeal 65

6. Conclusion and outlook 66
6.1 Conclusion 66
6.2 Limitations 68
6.3 The generalization of the research 69

7. Bibliography 71

Acknowledgment

First and foremost, I would like to thank my supervisor Johan Lindell for his precious help and instructions. He always gave me very clear and helpful advice with great patience from beginning to end.

I would like to thank my parents Chao Guorong and Mei Yan for their invaluable support without expecting anything in return. My master study at Uppsala University would be impossible without their support financially and psychologically.

I am incredibly grateful to my boyfriend, Julian Feijoo, who has always been with me and taken care of me. He did brainstorm with me to help me think and proofread most of my thesis with his amazing language skill. Most importantly, I am thankful to have him handle my complain and moan.

I am also thankful to my friend Claudia for always listening to me and comforting me when I run into troubles in the past four months.

1. Introduction

1.1 Setting the Scene

The current popularity of social media, such as Facebook and Twitter in the western world, and Weibo and Wechat in China, has brought about changes in health crisis communication. Social media has become the main source of news online, and plenty of internet users receive breaking news from social media instead of traditional media (Forbes, 2018). Different from the one-to-many information distribution model of traditional media, social media platforms encourage users to generate content and disseminate information through their own networks (Vos and Buckner, 2016). Recently, a coronavirus (named COVID-19 by WHO[1]) outbreak that originated in Wuhan China has sickened tens of thousands of people in just one month has become a public health crisis in China (StoryMaps, 2020). It threw everyone living in China into a different way of life in which you constantly have to be careful to not be infected with this highly contagious virus. The most horrible thing is that so far we don't have any specific medicine for the coronavirus infection. It reminds people of the SARS outbreak in China from November 2002 to September 2003. However, from the aspect of communication, the Covid-19 outbreak is different from the SARS outbreak as it is the first public health crisis in China since China has entered the age of social media in 2009 (when Weibo came into being) (Zhang, 2020). Statistics have shown that WeChat and Weibo rank first and third, respectively, as information sources about the coronavirus for the public (Zeng et al., 2020). Weibo is known as Chinese Twitter; at the beginning of 2019, it had 430 million users in China (ChinaZ, 2019). Since the coronavirus broke out, plenty of information about the coronavirus crisis have been spread among social media users in China who account for 71% of the Chinese population (We Are Social & Hootsuite, 2019). Weibo's trending topics have been occupied by content related to the coronavirus ever since information about the outbreak reached the public. Moreover, the transit going in and out of Wuhan has been shut down since January 23 to contain the coronavirus outbreak (Chan, 2020), after that, more and more cities have been locked down by the government. Therefore, social media has become a key vehicle for people to know what's going on in the hardest-hit areas.

[1] World Health Organization

1.2 Aims and research questions

The coronavirus outbreak is the first health crisis China has met since social media got popular there. Statistics have shown that the public heavily relies on social media as their information sources to get to know about the outbreak in China (Zeng et al., 2020). This is different from the situation in some other countries; for example, statistics have shown that in Germany social media only rank fifth as coronavirus information source (Statista, 2020). This study aims to examine the connection between the large penetration of social media in China and the development of the health crisis communication from both the perspectives of the health communicators and the audience. In terms of the digital transformation of the traditional mass media, this study will investigate the communication strategy of mass media institutions communicating via social media. More specifically, it tries to find out if the influential state-owned social media accounts have taken over the function of health communicators based on the Crisis and Emergency risk Communication (CERC) framework. Also, it pays attention a possible participatory nature commonly observed on social media. Therefore, the research questions are as following:

RQ1a: **In the coronavirus crisis, what roles do the state-owned media play in health crisis communication in terms of the kind of messages they delivered on Weibo?**
RQ1b: How is the quality of the messages?

It was shown that during the outbreak, the main information sources for coronavirus on Weibo are the top trending messages and messages by state-owned media accounts (Zeng et al., 2020). Independent health organizations have little influence compared with the state-owned organizations. We can see this from their follower numbers on Weibo: The Weibo accounts of the state-owned news organizations People's Daily and CCTV News have more than 100 million followers each, and the government political organization Communist Youth League has more than 13 million followers on Weibo, while the Chinese CDC only has 50 thousand followers and little visible public engagement (its posts have almost no comments and likes). A previous study about the health communication on Weibo also shows that state-owned news organizations and the government political organizations play the most

vital role in leading public opinion and educating people during a health crisis, while health organizations play a minor role (Cui, 2014). Therefore, in the course of a health crisis, it is the government-related organizations that take over the responsibility of communicating with the public in the social media era. The Crisis and Emergency Risk Communication (CERC) framework was developed based on experiences of American CDC health communicators for those public health professionals who are in charge of responding to the public under emergency situations (Veil et al. 2008; CDC, 2018). It has become a principal for health communication in the face of a crisis.

On account of the big influence of state-owned media, RQ1 is designed to figure out their communication strategy during the outbreak if they have one. As the mouthpiece of the government, different from commercial news providers, do they function as health communicators and follow the CERC framework in the coronavirus crisis? My research focused on accounts related to the Communist Party of China, including the state-owned news media and the accounts concerned with domestic political affairs. All of the four chosen accounts posted messages about coronavirus every day and had great influence on the public. Based on the data I collected via Weibo API, I analyzed if the social media messages can be classified as sensemaking or efficacy messages according to the CERC framework via KH Coder. Then I examined the quality of the messages in different categories in terms of the message content and the impact it could cause by taking some posts as examples.

RQ2: How is the public engaged with the health messages on Weibo?

Given the participatory nature of social media, to further examine the messages on social media, it's necessary to take the public engagement into consideration. Furthermore, health communication encourages two-way communication, which is why the CERC framework aims to build relationships between the organization and the public to better employ health communication to the public. Therefore, the status of social media engagement is the second question that I want investigate. With the help of a Weibo API and a coding programme, the message engagement will be assessed according to the number of retweets, likes, and comments based on the disaggregated data. The results are discussed based on the theoretical basis of virality on social media.

Overall, the two research questions are designed to find out about the the quality and the effect of the communication by four state-owned media on Weibo during the outbreak. The investigations of both the messages and the message engagement allow us to have a more comprehensive look at the health crisis communication on Weibo.

1.3 Relevance and contribution to the field

Communication researchers have developed a solid knowledge system in crisis communication. With the development of the Internet, social media has been used as an important vehicle for crisis communication, however, to date there is scarce knowledge about its influence on the outbreak of an infectious disease (Guidry et al. 2017), since public health crises are infrequent and people might pay more attention to disease transmission itself rather than to information dissemination.

In theory, social media looks promising in this regard: As pointed out by Wise (2001) the key mission of public health is preventing a disease from spreading, and communication is at the heart of informing and empowering the public about health issues. More meaningful and interactive two-way communications during health crises are established thanks to social media (Guidry et al. 2017). This study considers the role of the dual nature of social media in health communication between the organization and the public by analyzing engagement with health communication. This adds a new dimension to the previous studies related to health communication on social media which are mainly concerned with the change of information dissemination and health promotion.

Generally, existing studies of the health communication have tended to examine the effect of social media on health information dissemination and promotion, and the studies of the usage of social media during a health crisis have mainly focused on disease tracking (Vos & Buckner, 2016). There are also studies on social media engagement in contagion crisis communication which are mainly concerned with how public health organizations utilize social media to address the crisis, mainly in western countries. Vos and Buckner (2016) also studied the H7N9 outbreak in China, i.e. they critically analyzed Twitter messages during the

outbreak for their sensemaking and efficacy standard according to the CERC framework. However, Twitter is not among the most influential social media in China. This study is designed to examine the usage of social media by state-owned news organizations in China to employ health communication and analyzes empirical data based on CERC. It provides an analysis of this communication Weibo, a platform highly relevant to the actual location of the outbreak.

Media industries have mostly paid more attention to approaching audiences from the viewpoint of engagement. Media engagement is not only a buzzword within marketing research but also an important topic in academic research in communication studies. Different theories and approaches have been developed to analyze media engagement. In health communication, scholars hold different opinions about the impact of social media on health communication. Some think social media is a useful communication tool for organizations to engage with the public, while some point out that organizations are not fully harnessing the participatory nature of social media to hold meaningful conversations with the public (Heldman, Schindelar and Weaver, 2013). Previous studies mostly focus on general interactive features of social media and the organization-public relationship in daily health communication and behaviour cultivation (Smith & Gallicano, 2015; Liu et al., 2016; Park et al., 2015; Lee & Sundar, 2012). This study presents an assessment of social media engagement in a specific ongoing health crisis from the perspective of Chinese media environment.

Unlike in other crises, in a public health crisis people's health and lives are at stake. I believe it is an important subject to investigate the communication strategy on social media as well as the effect of social media engagement. Besides, I hope this study will contribute to health crisis communication in China which is still developing and lacks elegant theory support. I also hope this study can help people to better understand the role of social media messages in a health crisis.

1.4 The actors on Weibo

We cannot discuss the influence of social media on health communication without clarifying the online environment itself. Therefore, first I want to introduce different key actors of health information on Weibo. In the case of a public health emergency, thousands of health messages from the authority or individuals are initially distributed on Weibo. The most influential news channels are state-owned media like People's Daily and CCTV News. People's Daily is the official newspaper of the Central committee of the Communist Party of China. CCTV News is China's main state broadcaster. They both shifted the paradigm of media coverage - mass media institutions now mainly communicate with the public via social media. In addition, there are two special accounts on Weibo - Communist Youth League Central Committee and Ziguang Pavilion. The Communist Youth League is a organization for young citizens between the ages of fourteen and twenty-eight, run by the Communist Party of China ("Communist Youth League of China," n.d). Its Weibo account delivers the messages about the central government affairs online from the Communist Party to the public. Ziguang Pavilion is a monthly political magazine sponsored by the Communist Party of China, it also makes use of social media to distribute information and communicate to the public. These two Weibo accounts are considered as the mouthpiece of the Communist Party. Apart from those, commercial media such as Toutiao, Sanlian, and The Paper play critical roles in the message dissemination. Besides, we-media can not be neglected in influencing public opinion. We-media is also known as "citizen media" and "self-media" (Kuo, 2018). We-media allows ordinary people to be information provider and communicator, to spread their own stories and news independently and to communicate with other users. We media can even enable individuals to create their own "business" – e.g. a popular youtube channel – without having to rely on any organization (MediaInTheFuture, n.d.). On one hand, we-media create their own content which may or may not be reliable. On the other hand, we-media can affect public opinion by taking the side of other accounts. However, compared with the above media channels, there are almost no such influential accounts of public health organizations on Weibo. The official Weibo account of the National Health Commission of the PRC only has 5.6 million followers, and the retweets and comments of its coronavirus-related posts are far less than the state-owned media and other popular public media channels.

1.5 The COVID-19 outbreak in China

On February 11th 2020 the WHO chose the name COVID-19 (Coronavirus Disease 2019) as the official name of an infectious disease caused by the novel coronavirus. The virus itself is called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (WHO, 2020a). There is still no conclusion about the origin of this new virus. According to the WHO (2020b), "The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment". For about one month, before being named by the WHO, the disease was known as Novel coronavirus pneumonia. On December 8th 2019, Wuhan China reported its first patient as "an unexplained pneumonia case". Until the end of December, 27 cases in total were reported in Wuhan. On December 30th, Li Wenliang – an ophthalmologist at Wuhan Central Hospital who would later, after his death from Covid19, be honoured as the whistleblower who first warned the public of the danger of the virus – received an internal diagnostic report of a suspected SARS patient from other doctors. He shared it with his fellow medics and family members warning of a virus that looked like SARS ("Li Wenliang," 2020.). Later the report was circulated publicly, and it aroused a discussion that the SARS has come back. On January 1st 2020, eight people (including doctor Li) were admonished by Wuhan police for "making false online comments" and were investigated for "spreading rumours" (BBC, 2020) because they sent Wechat messages to people warning that the "unexplained pneumonia" might be SARS (ibid.). On January 11th, the "unexplained pneumonia" was determined not to be SARS, but Novel coronavirus pneumonia. The first death case was reported on the same day. Two days later, Thailand confirmed the first case outside Wuhan. On January 15th, the Chinese Center for Disease Control and Prevention (China CDC) activated a first-level public health emergency response. The coronavirus was not determined as being human-to-human transmittable until January 20th by Zhong Nanshan, a scientist who was appointed by the Chinese government to lead the battle against the disease (Business Insider, 2020). On January 23, the entire city of Wuhan was put on lockdown, prohibiting transit in both directions (Chan, 2020). "The WHO declared the coronavirus outbreak a Public Health

Emergency of International Concern (PHEIC) on January 30th 2020, and a pandemic on March 11st 2020" (WHO, 2020c and WHO, 2020d). On March 18th, Wuhan reported zero increase in COVID-19 cases. At that point, China had officially reported 80928 total confirmed cases and 3245 deaths. The zero increase in Wuhan marked a turning point of the outbreak in China. At the same time, Europe and the United States became the epicentres of the outbreak.

2. Literature Review

In the following part, I would first like to introduce the adoption of mobile communication devices and Internet services in health practices. Although the research aim is to investigate the health crisis communication on social media, a brief introduction of mobile health provides additional background knowledge of the development of mobile applications in the public health sector. Second, I outline the increased influence of social media on mass media in terms of the audience participation and gatekeeping, because the four Weibo accounts I choose are operated by mass media organizations. That mass media organizations chose Weibo as a new platform to communicate with their audience makes it essential to explain the integration of social media and mass media. Third, I outline the importance of social media as a health communication tool. I emphasize the features of Twitter because it resembles Weibo, and it attracts more attention from the research field. In the last section, I briefly talk about two relevant case studies in this research field to show the previous studies more descriptively and help readers understand the research logics in the field. The first one is about the usage of social media by health organizations during an Ebola outbreak. I focus on reviewing the research process and findings. The second one is research which examines the tweets in the H7N9 outbreak using the CERC framework, with a review emphasis on the theory and the application of the theory. The CERC framework also serves as a fundamental theoretical framework of my own research. Therefore, it will be further explained in the theory part.

2.1 Mobile health

Mobile health (mHealth) is a term used for the healthcare practices supported by smartphones and other mobile communication devices, for collecting, transmitting and analyzing health-based information (Adibi, 2015). "Mobile health technologies have been integrated into the healthcare delivery system, particularly in developing countries" (Gurman, Rubin and Roess, 2012, p.82). By reviewing 16 relevant articles, Gurman, Rubin and Roess (2012) argue that there is a positive correlation between the usage of mHealth and behavior change communication (BCC). Namely, mHealth provides people with useful information and educates people about positive behaviors for better health. They find that particularly in Africa and Asia, mHealth offers better health services: hotlines, text messaging services, mobile midwifes, SMS reminders, private sexual and reproductive health help, etc. Smartphones offer patients a chance to benefit from social support regardless of time and location by making it possible to have immediate access to social media sites and social networking apps (Adibi, 2015). In his work, Adibi (2015) focuses on investigating the development of mHealth technologies from different engineering perspectives including "preventive and curative medicine, remote health monitoring, communication networks and systems, cloud-based applications and other issues revolving around mHealth" (p.1). In *Health Literacy: Social Media and Mobile Health,* Boulos (2013) specifically pays attention to social media. He thinks social media is the best platform for health organizations to distribute information and educate the public since people are already actively using social media, in contrast to the health organizations' self-built isolated websites with one-way information flow. According to Boulos (2013), social media play an important role in improving health literacy[2] as explained below: 1) Social media can make it easier for users to access health information and therefore make better decisions. 2) Online social networks also make peer-to-peer support possible. 3) Recommendations for software apps, including those that are related to health, can be found on the mobile social web. 4) People with long term conditions especially but not exclusively benefit from the way smartphones and apps are transforming health care. However, he also supposes that the risk associated with social

[2] "health literacy is defined as the degree to which an individual is capable of obtaining, communicating, processing, and understanding basic health information and services to make appropriate health decisions" (CDC, 2019)

media is generally higher than those of conventional media because everyone can publish everything they want on social media which can lead to the risk of viral dissemination of misinformation and disinformation (ibid.).

There are also some studies particularly about the usage of mobile health technologies and chronic disease as well as infectious disease in developing countries. For instance, Kahn, Yang and Kahn (2010) propose a conceptual model to interpret in which ways mobile health can contribute to the health care challenges and investigate the correlation between wealth and health in developing countries. In their work, the following services are considered mobile health services: web-surfing, web-based learning, email/text messaging and social networking sites. My focus is social media, so I only discuss the content related to social networking sites here since they can be seen as a subcategory or a primitive form of social media (Cohn, 2011). They sort the level of mHealth applications into large geographical areas, communities and individuals. Social networking platforms play a vital role in both large geographical areas and communities. In large geographical areas, a short message on social networks can alert millions of people and provide advice to the public, particularly in an epidemic, and thereby lowers exposure to the threat. Besides, it is also effective in educating people about healthier behaviors. In the community, the two biggest benefits turn out to be sharing experiences and peer-to-peer education.

A point worth noting in the discussion of the usage of social networking sites in healthcare practice, which is discussed both in Boulos' work and Kahn, Yang and Kahn's work, are the risks of mHealth. Kahn, Yang and Kahn (2010) think incorrect information and poorly-designed campaigns on social networks could cause havoc and unintended effect. Like Boulo, they underline the risk of misinformation and disinformation but they didn't go deep into any specific case to elaborate on the cause and effect.

2.2 The effect of social media on mass media

The way people communicate information and consume news has changed drastically since social media was born (Coe, 2016). The users tend to keep up with the latest news on social

media (Martin, 2018). On the one hand, social media has put much pressure on traditional media and is making them lose ground, on the other hand, social media forced traditional media to accommodate the change in behaviour to stop the decline. Taking Weibo as an example, by 2013 already at least 162 TV stations and 522 newspapers had opened Weibo accounts (Chen, 2013).

In the history of communication, the birth of new media never merely created a new conversation tool, but broke the existing balance between media and affected the public's lifestyle and values in terms of forms and contents (ibid.).

According to Chen (2013), the audience in mass communication is essential but only acts as passive recipient. Moreover, the industrialization and monopolization of mass media led to a market-oriented communication model. The idea of the audience being consumers was deeply ingrained in mass media communication. The relationship between the media and the audience could be similar to a seller and a buyer (Liu, 2006). In a sense, the development of the mass media weakened the position and ability of the audience. The emergence of social media changed the traditional communication structures by empowering the audience to speak for themselves (ibid.). The revival of the power of the audience was not caused by the social media itself but by the audience's demand for voicing their opinions which had been almost impossible for a long time (Chen, 2013). Social media such as Weibo provided a platform to satisfy the demands, with which the new media and traditional media changed from competing with each other to working together. Both sides have been adjusting their strategies to keep up with the changing situation (ibid.).

According to Gabriel Tarde (2008), "In all times, the motivation for the transformation of public discourse is a private conversation." Private conversation is the basis and logic start of mass communication. The mass media made private conversations into public opinion by filtering, organizing and amplifying private conversations (Chen, 2016). The mass media had developed very quickly, thanks to the success of making private conversations public. However, Chen (2016) also argues that private conversations could only act as the information source of the content of mass communication due to the highly industrialization

and monopolization of mass media. In the past, if a private conversation wanted to spread, it ultimately relied on the decision made by the media.

The main characteristic of social media is to empower the audience and to publicize private conversations by retweeting and commenting them, for instance. Thus, social media messages combine the feature of a private conversation and public communication (Chen, 2016). Moreover, Liu (2011) argues that the fragmentary private conversations gain value in the process of spreading and getting connected with one another, thus further developing into more potent and consistent opinions. It breaks the old path of the media playing a leading role in forming public opinion; instead, the collection and organization of fragmentary information on social media form public opinion (Chen, 2016). The significant change in the formation of public opinion inevitably led to the integration of new media and traditional media.

2.3 Social media as a health communication tool

What is social media? Safko and Brake (2009) think it is a variety of online technology that enables users to share content in various ways, such as text, video or multimedia. Social media empowers users to control the creation and dissemination of information (Coombs, 2015). Coombs (2015) proposes that social media is a broad term which contains various online communication channels/tools, e.g. social networking sites, blogs, microblogs, wikis, forums. Coombs (2015) sums up five characteristics of social media in his work *Ongoing Crisis Communication:* (1) participation: anyone can generate content and give feedback on others' contents; (2) openness: most social media allow people to speak and share their opinions; (3) conversation: social media make two-way interaction easier; (4) communities: social media facilitate the formation of groups based on similar interests; and (5) connectedness: content frequently places references to other content (Voit, n.d.). The characteristics show us the dual nature of social media which allows mass information dissemination, while at the same time implementing the dialogic communication with their audience (Heldman et al., 2013; Park et al.,2015).

Social media has become a powerful communication tool for public health organizations due to its efficiency and convenience. The American CDC points out that social media can be utilized as communication tools in health communication activities (CDC, 2011). It also identifies the features that qualify social media important channels for health communication (Heldman et al., 2013). Heldman, Schindelar, and Weaver (2013) have made a good summary of the characteristics identified: 1). Social media are most effective when combined with traditional communication channels of health communication 2). Social media facilitate reaching and targeting diverse audiences 3). Social media allow listening to feedback in real-time 4). Social media lead to increased direct engagement.

Meanwhile, Park Hyojung, Reber H. Bryan and Chon Myoung-Gi (2015) narrow it down to specific social media: Twitter. They aim to figure out how public health organizations utilize Twitter as a health communication tool. Although my own study aims to examine the posts on Chinese social media, it is essential to discuss Twitter as a communication tool since Weibo and Twitter share functionalities, and they are highly comparable (Criscione, 2019). Although Weibo and Twitter, two mainstream microblogging services in the East and West, have different user interfaces and services/products, they both allow their users to publish and share short messages (Gao et al., 2012). The engagement behaviours (search, post, follow, retweet, like, comment and hashtag) on Weibo and Twitter are also the same. However, compared to Weibo, Twitter has attracted much more attention from the research field (Criscione, 2019). Also, people who are not from China are more familiar with Twitter; a discussion of Twitter will help people to understand the microblogging service as a health communication tool. In the West, Twitter has been seen as "an effective communication and engagement tool" (Funk, 2011; Li & Bernoff, 2011). Health organizations can make the most of Twitter features to encourage public engagement (Park et al.,2015). In *Tweeting as Health Communication: Health Organizations' Use of Twitter for Health Promotion and Public Engagement,* Park Hyojung, Reber H. Bryan and Chon Myoung-Gi (2015) have summarized the key features of Twitter as below to help understanding Tweeting as a way of health communication. For example, the retweet and reply functions allow users to repost other users' tweets and communicate with other users synchronously (ibid.). Liking on Twitter allows the public to affectively evaluate the post (Liu et al. 2016). According to Gallant et al. (2011), incorporating hyperlinks into posts makes it possible for the health organization to

link to credible information sources to provide additional information to the audience. Hashtags is another important Twitter feature, Park et al. (2015) argue that hashtags are "words (or phrases with no spaces) visually prefaced with [...] '#' " (p.2). Finding relevant tweets and following emerging trends on social media is facilitated by hashtags (Funk, 2011). Health organizations can create their own hashtags to increase their online visibility, and promote them by using other popular hashtags (ibid.). Hashtags can become especially important in the face of large-scale disasters or a pandemic, where up-to-date information needs to be made available rapidly (Milbrath, 2012). In conclusion, Twitter serves as a health communication tool that enables dialogic communication and efficient information sharing.

Park Hyojung, Reber H. Bryan, and Chon Myoung-Gi (2015) have a positive opinion of the use of social media in the public health sector: They suggest that social media is a useful communication tool and the public health organizations are leveraging social media to engage more with the audience. In contrast, Heldman, Schindelar and Weaver (2013) point out that little evidence shows that public health organizations are fully harnessing the participatory nature of social media to hold meaningful conversations with the public. Therefore, they propose two considerations for social media engagement in health communication. Firstly, although social media allow public health organizations and the audience to connect with each other, the authors question whether this connection is long-lasting or only short-lived (ibid.). They suggest the public health communicators to adequately leverage the unique features of social media to maintain a consistent engagement approach (ibid). Secondly, online health communication has a limited impact on the public if people don't take action to change their health behavior (ibid.). Therefore, the effects of engagement on people's health behavior changes should be considered.

2.4 Two case studies

2.4.1 The usage of social media by public health organizations during Ebola

There are also specific studies on how public health organizations utilize social media during the outbreak of an infectious disease. For instance, Guidry et al. (2017) conducted research on the ways in which public health organizations deal with Ebola on Instagram and Twitter. I

will elaborate the result as well as the methodology of this research. The study examines Ebola-related posts by the Centers for Disease Control and Prevention (CDC), World Health Organization (WHO) and Médecins Sans Frontières (MSF, also known as Doctors without Borders)" (Guidry et al., 2017, p.1) on Instagram and Twitter. They employed content analysis as the main method to analyze the context and content of the communication on social media by these three leading health-focused organizations and the public's responses. They introduce the engagement score as a coding item, which for twitter is defined as the sum of frequencies of retweets and favorites, and for Instagram as the sum of frequencies of likes and comments (Guidry et al., 2017). The way the authors coded the engagement score inspired the coding of message engagement in my research. In my work, I sum up the frequencies of likes, comments and retweets of every message, and then calculate the average number for the different message categories. Guidry et al. (2017) also code the posts according to the emotion expressed in the post which helps them understand the potential implications of every post. The findings indicate that non-profit organizations, in this case MSF, have the highest levels of public engagement on Instagram. They also found that visual communication such as photos and infographics engages more with the public. It is also evident that "non-profit organizations are more dependent on the public and are therefore more likely to adapt to the needs and preferences of their publics" (Guidry et al., 2017, p.8). In other words, non-profit organizations may have elicited more trust than government agencies in a pandemic-related health crisis (ibid.). This argument is also supported by Saxton and Waters (2014) who found that nonprofits tend to make dialogic communications on social media to build relationship with the audience partly so as to call for volunteers and help with advocacy. Another important finding is that people generally tend to pay more attention to negative information than positive information which influences people's risk perception. That's also why MSF earns more trust from the public because it regards discussing the negative part of the outbreak as an important approach to engage the public instead of ignoring the public's fear as irrational or unwarranted (ibid).

The findings of this research speak highly of the non-profit organization in terms of its communication strategy as well as public engagement. The absence of non-profit public health organizations and the dominant position of government agencies in China make it difficult to make a similar comparison. However, it still inspires me to analyze the

communication strategy and message engagement of different government agencies in China. Especially the analysis of negative information and positive information resembles what I aim to do in the “incentive appeal” analysis.

2.4.2 A H7N9 case study based on the CERC framework

Vos and Buckner (2016) make use of the Crisis and Emergency Risk Communication (CERC) framework in their work to study public’s messages on Twitter during the bird flu outbreak. The CERC framework is an integrated model developed by the health communicators at the Centres for Disease Control and Prevention (CDC) for those public health professionals who are in charge of responding to the public under emergency (Veil et al. 2008; CDC, 2018). The CERC framework also is a fundamental theory in my research, leading me to explain its usage in this case study.

The CERC framework combines various existing theories and compiles them into a communication guideline for times of crisis. Within this framework, any crisis is thought to pass through 5 distinct stages. Vos and Buckner (2016) examine the sensemaking and efficacy messages on Twitter on the basis of the first two stages of CERC framework since “self-efficacy and sensemaking are fundamental processes in crisis response” (Veil et al., 2008). In the emerging stages (pre crisis and initial event), sensemaking messages are supposed to "educate the public about the nature of the risk" (Vos & Buckner, 2016, p.301-302). Simultaneously, efficacy messages give advice on how to appropriately react to the situation. This gives individuals trust both in the effectiveness of the recommended measures, as well as in their ability to enact them (Vos & Buckner, 2016).

A study by Chew and Eysenbach (2010) examined tweets during the 2009 H1N1 flu pandemic. They discovered that over half of the analyzed tweets contained information about the virus. A majority of these tweets provided links as references; however, most of the time not to traditional public health authorities. Since then, due to the increasing popularity of Twitter, both the WHO and CDC have opened accounts there and utilized them to inform on potential health crises such as H7N9 in 2013. This inspired Vos and Buckner (2016) to analyze health communication during that same crisis to find out whether these messages really held up to the sensemaking and efficacy standard. Their findings show that social

media is a medium for sensemaking in which the messages help the audience to make sense of the emerging crisis (Vos & Buckner, 2016). However, the H7N9 virus only spread in China, but their study exclusively examines posts written in English. Also, they are not able to reach the messages on Chinese social media platforms which are supposed to have more information about the H7N9 virus (ibid.). Therefore, their findings suggest that Twitter doesn't offer a platform which contains enough efficacy messages for the public (ibid.). Even though the CDC and the WHO did post efficacy messages about the H7N9 virus on Twitter, those messages would only spread if their followers retweet them due to the networked nature of social media (ibid.). To Twitter users who were very far away from the crisis centre, the information might feel too irrelevant to encourage the dissemination of the efficacy messages (ibid.).

The limitation of this study is quite apparent: their research was conducted on Twitter; however, the outbreak happened in China. Twitter is banned in China, and the researchers were not able to reach the messages on Chinese social media. That might affect the validity of the results. My research, on the one hand, is inspired by this research - the way they use the CERC framework to code the messages - on the other hand, I want to improve the accuracy of the result by conducting my research on a Chinese social media where the outbreak was happening. Besides, Vos and Buckner's research focuses more on analyzing the organizations' health communication by examining 3000 related tweets randomly selected from different unique individual accounts. However, the focus of my research is more specific and purposeful: all the messages are selected from the specified organizations, which helps examine the organizations' health communication more directly and efficiently.

3. Theoretical framework

This chapter provides an overview of the theoretical concepts that I use to formulate the research and analyze the empirical data. The theories can be divided into two disciplines. The concepts of risk communication and crisis communication and the CERC framework are used to provide a theoretical tool for analyzing the messages in order to answer **RQ1**. CERC framework offers a communication guideline in a health crisis; emphasis is put on the process

of sensemaking and self-efficacy. The concept of risk communication and crisis communication offers a fundamental understanding of the CERC framework. Social media engagement and virality on social media are used for analyzing the engagement data which helps to address **RQ2.** Social media engagement introduces the definitions of different engagement and engagement behaviours on social media: retweets, likes and comments, and the pros and cons of social media engagement. Virality on social media, which is articulated by Liu, Lu and Wang (2016), discusses the authority, privacy, evidence and incentive appeal in terms of social media engagement with messages.

3.1 Risk Communication and Crisis Communication

I consider the concept of risk communication and crisis communication from the perspective of both the public health sector and the academic communication sector. Risk communication is "an interactive process of exchanging information about the specific type (good or bad) and magnitude (strong or weak) of an outcome from exposure or behavior" (CDC, 2018) among individuals, communities, and organizations. Risk communication is a discussion of the negative outcome that helps the individuals to prevent those outcomes by changing their behaviors (ibid.). It doesn't necessarily concern something happening now, but something that might happen in the future. For example, Risk communication is concerned with informing people about how to limit the risks in the case of a flood (Reynolds & Seeger, 2005). According to Witte et al. (2000), risk communication is to a large extent based on fear appeal; confronting the public with risks persuades them to change their behaviour to minimize those risks. Sandman's model of risk as a function of hazard and outrage (1993, 2002) has also helped to develop communication strategies, e.g. by assessing the public's reaction to different risk factors. The effectiveness of a message is also determined by the credibility of its source. According to Freimuth et al. (2000), risk messages should be simple and offer solutions. Murray-Johnson et al. (2001) found that messages should be designed to specifically target a certain group of people in order to maximize effectiveness.

Crisis communication initially is more about informing the public of the facts of an unexpected emergency which might ruin an organization's reputation (ibid.). In other words, it is originally a responsibility of companies PR divisions; it has developed from trying to

hide and distort facts about an incident in order for the company to keep its image, to a more honest and complete coverage of the event. The purpose of the crisis communication is to reduce the harm to the organization's reputation and viability, but it can also make the situation worse (ibid.). Nowadays, crisis communication is applied in a lot of situations, for instance, the public health organization or the authority will employ health crisis communication in a health crisis to keep the public informed of the facts of the disease and information about harm mitigation resources and procedures (Mileti & Sorensen, 1990; Sorensen, 2000).

In the public health sector, on the other hand, risk communication is mostly about risks to public health and about getting the public to change their behaviour in order to minimize the risk. Examples are warnings about the consequences of smoking, information about STDs (sexually transmitted diseases) and safe sex, but also environmental hazards such as the consequences of toxic chemicals. The underlying goal of informing the people is putting them in a position where they can make informed decisions about exposure to risks and/or handle conditions more competently (Reynolds and Seeger, 2005). As the public's opinions about risks often do not correspond to the scientific facts (Ropeik & Gray, 2002), risk communication frequently seeks to convince people of a more accurate view of the risk. Therefore, a common strategy is to get experts with high credibility to explain a phenomenon in words that the average person can understand (Reynolds & Seeger, 2005). A well-established strategy of risk communication is a problem-solution message structure, where a threat is introduced, followed by information about how a certain behavioural change can decrease the risk of that threat becoming a reality (Witte et al., 2000).

Risk and crisis communication are very similar. Some even suggest that "crisis communication is a more limited form of risk communication" (Lundgren, 1994; Reynolds & Seeger, 2005). Reynolds and Seeger (2005) argue that they both create messages in order to induce certain responses of the public, use mass communication channels and rely on credibility as the main persuasive attribute. They also share the purpose of preventing or reducing public harm.

Reynolds and Seeger (2005) point out that there are also differences between risk and crisis communication. While risk communication is a standard procedure, where a lot is known about the topic that is being discussed, and organizations have time to carefully craft the messages, crisis communication is more specific to rare events with limited knowledge about the nature of the threat and more pressure to disseminate whatever information there is rapidly (ibid.). Moreover, crisis messages are often more informative, such as news distributed through media, while risk messages focus more on persuading instead of informing, like advertising and public education campaigns (ibid.).

3.2 Crisis and Emergency Risk Communication (CERC) framework

Crisis and Emergency Risk Communication (CERC) framework was developed based on experiences of CDC health communicators for those public health professionals who are in charge of responding to the public under emergency (Veil et al. 2008; CDC, 2018). The CERC framework combines various existing theories and compiles them into a communication guideline for times of crisis. Within this framework, any crisis is thought to pass through 5 distinct stages: pre crisis, initial event, maintenance, resolution, and evaluation.

According to Veil et al. (2008), it is a grounded theory: A theory that has been developed from data, to try and explain what has been observed and experienced. In an attempt to explain, larger existing literature can also be drawn from. The theory that is developed tries to predict what will happen/how people will behave. Different theories from the literature help in doing that: For example, the social-ecological model pays attention to the interplay of factors such as individual ones, community and societal factors (ibid.).

Public health communication applies two-way communication strategies that involve developing information scientifically, disseminating it strategically and evaluating its relevance, accuracy as well as making sure it is understandable, all to improve the health of the public (Bernhardt, 2004, p. 2051). Listening to feedback allows them to improvise based on context and to provide understandable health information to the public (May & Mumby,

2005). Responses recommended by CERC arise from a combination of best practices from risk and crisis communication literature and the CDC's experience (Veil et al., 2008). Two fundamental processes that are recommended are sensemaking and self-efficacy (ibid.).

3.2.1 What is sensemaking?

Sensemaking literally means making sense. It is an individual's process of making sense based on past experiences and personal interpretation (Weick, 1988; Weick, 1995). If this fails, the individual "becomes confused and may act irrationally" (Vanderford et al., 2007). Taylor and Van Every (2000) define sensemaking as "a way station on the road to a consensually constructed, coordinated system of action, turning circumstances into a situation that is comprehended explicitly in words and that serves as a springboard into action " (p.275, p.40). There are three points to be taken from this to understand sensemaking (Weick, Sutcliffe, and Obstfeld, 2005): First, sensemaking can only work if the circumstance can be understandably described in words; second, these messages are organized in the form of written or spoken texts; third, institutions silently shape behaviours (Gioia et al. 1994). Importantly, sensemaking can be realized in the form of language, talk, and communication in pursuit of mutual understanding and patterning (Weick, 1995; Weick et al.,2005). Weick (1995) concludes the key meaning of sensemaking as follows:

> "If accuracy is nice but not necessary in sensemaking, than what is necessary? The answer is something that preserves plausibility and coherence, something that is reasonable and memorable, something that embodies past experience and expectations, something which resonates with other people, something that can be constructed retrospectively but also can be used prospectively, something that captures both feeling and thought, something that allows for embellishment to fit current oddities, something that is fun to contrast. In short, what is necessary in sensemaking is a good story" (pp. 60-61).

As Weick (2005) points out in his later work, the focus of sensemaking is to portray the story and find the meaning of what is going on to resonate with others, because plausible stories animate and take effect. To materialize it, even smallness should be appreciated. A small structure can make a big difference (ibid.).

The sensemaking concept has to do with situational awareness (Dervin, 1983,1992). It explains how people collect information in order to understand what is going on around them (Boin et al., 2014). Especially during extreme situations, people try to fill gaps in their understanding to try and make sense of their surroundings (Weick et al., 2005).

Sensemaking is a natural process in which individuals attempt to navigate gaps in their understanding. Sensemaking activities are especially important in crisis contexts, where right sensemaking activities can be crucial while at the same time knowledge gaps are more likely (Seeger et al. 1998). Research suggests that there are various strategies of going about this, which usually involve drawing on a memory or past experience (Sutton & Woods, 2016). It seems to be less important weather this derives from own experience, a friends account, or the media. The dominant factor seems to be which content is most easily accessible when the sensemaking is taking place (Geurten et al. 2015)

In health communication, CERC draws from work on sensemaking (Weick, 1988, 1995; Weick, Sutcliffe, & Obstfeld, 2005) which states that "individuals search for meaning in response to uncertainty and ambiguity" (Weick et al., 2005; Vos and Buckner, 2016, p.301-302), a state which naturally occurs in the face of crisis. As this process is not necessarily driven by facts, but uses any experience perceived as related to the current problem, sensemaking messages are supposed to "educate the public about the nature of the risk" (Vos & Buckner, 2016, p.301-302).

3.2.2 What is self-efficacy?

If people are aware of their capacities to influence the crises, they will realize situations in which they can have a positive impact (Weick, 1988). This is called self-efficacy. In Bandura's earlier work, he refers to self-efficacy as people's confidence in their ability to take action required to cope with the prospective situation (Bandura, 1977). Then he expands the domains of self-efficacy functioning to include belief in the ability to "regulate one's motivation, thought processes, emotional states and the social environment as well as levels of behavioral attainment" (Bandura, 1993; Maibach & Murphy, 1995, p.38). Namely, high self-efficacy motivates people to behave in a way that they believe will allow them to

complete the tasks or overcome the difficulties (Maibach & Murphy, 1995). On the contrary, low self-efficacy can result in stress and depression (Bandura, 1994). Schwarzer and Fuchs (1995) think that self-efficacy is related to a personal sense of control. People's confidence in the capability to change behaviours and deal with the stress mirrors a personal sense of control over one's environment (ibid.).

Self-efficacy has been applied to the public health area to evaluate the extent to which patients will follow the instructions to improve their health conditions, such as changing behaviors and lifestyle. It has been found that a high self-efficacy is related to better compliance (Schwarzer & Fuchs, 1995).

One of CERC's goals is boosting self-efficacy among the public by "giving people something meaningful to do" (Veil et al.,2008). In their own words, CERC's function is "to provide information that allows [...] to make the best possible decisions about their well-being, under nearly impossible time constraints, and to communicate those decision, while accepting the imperfect nature of their choices" (CDC, 2007a, para 1). Acting makes individuals feel in control of the situation, contributing to their sensemaking and thus making them feel more comfortable with the situation (Veil et al., 2008). "The public must feel empowered in the event of a crisis to reduce the likelihood of victimization and fear" (CDC, 2003).

3.3 Social media engagement

A strategic social media management requires to consider if the users feel engaged and to what extent they feel engaged (Paek et al.,2013). Social media engagement is considered as a new paradigm in the Internet era (Johnston, 2014). The concept of engagement has been examined across different disciplines and applied to various contexts such as employee engagement, student engagement, community engagement and consumer engagement (Dolan, 2015). Scholer and Higgins (2009) provide a foundation for understanding engagement as "a state of being involved, occupied, fully absorbed, or engrossed in something" (Dolan 2015, p.39). Oh et al. (2010) found engagement to be the concept of ''progression from interacting with the interface physically to becoming cognitively

immersed in the content offered by it and then onto proactively spreading the outcomes of this involvement" (p. 25).

Social media engagement is an extension of consumer engagement. Consumer engagement refers to consumers' rational loyalty and emotional attachment to a brand (Appelbaum, 2001). It is a context-dependent concept because consumers engage with an organization or a brand through different touch-points (Gummerus, et al.,2012; Dolan, 2015). Social media engagement has emerged as a kind of consumer engagement that focuses on a special touch-point: social media. Although social media engagement is derived from a concept that is mostly used in marketing research, literature and practice (Brodie et al., 2011), social media engagement is now used a lot in communication research to understand social media behaviour. Smith and Gallican (2015) make social media engagement clear by emphasizing the distinction between social media usage and social media engagement: "Social media usage refers to the multiplicity of activities individuals may participate in online while social media engagement refers to the state of cognitive and emotional absorption in the use of social media tools" (p.83). The precise definition of social media engagement is rarely found in current studies. If we look at social media engagement as an extension of consumer engagement, some scholars would discuss it from a consumer perspective, as an online brand engagement involving "positive brand experiences that carry over online" (Hollebeek et, al., 2014). Calder, Malthouse, and Schaedel (2009) recommend defining engagement with a view on experience as "a collection of experiences" consisting of social media users beliefs about ''how a site fits into his or her life''.

When we try to analyze social media behaviour, we tend to represent engagement as a ''psychologically motivated affective state" (Kang, 2014, p. 402) which is concerned with the users' feelings about the content, as well as how they react to it (Bennett, Wells, & Freelon, 2011). Social media features including searching, commenting, sharing, liking and hashtagging are all considered engagement (Hargittai & Hsieh, 2010; Nichols et al., 2006). It is agreed that social media engagement allows the users to be involved in the process of the creation and distribution of information (Campbell, et al., 2011). Also, through social media activities, the users are able to construct public profiles and express themselves online (Ahn & Bailenson, 2011; Kang, 2014; Rains & Keating, 2011), leading engagement to a concept

concerning reputation in online communities that is consistent with Phillips' (2008) argument that ''people define themselves through the messages they transmit to others'' (p. 80).

Moreover, social media engagement is considered as emotionally attached and inherently social. Engaging through social media often involves mutual trust and interaction, and allows people to fulfill their need for socializing (Hung et al., 2011, p. 99, 102). Frequently, social media also serve to strengthen relationships (Hargittai & Hsieh, 2010). Social media engagement often involves online support and interaction (Bennett et al., 2011; Rains & Keating, 2011).

However, every coin has two sides. It is necessary to look at both. There is also literature on the negative aspects of social media engagement (McCay-Peet & Quan-Haase, 2016). According to McCay-Peet and Quan-Haase (2016), public engagement on social media can be manipulated, for example, some companies will inflate the reputation by creating false reviews or buying "recommendations" from the public on social media. Also, engagement is often reduced to sheer numbers rather than content, such as business competition in follower and post view counts. Some companies even make it a business to sell followers or likes to accounts. According to McCay-Peet and Quan-Haase (2016), this excessive focus on numbers might affect users' self-worth, e.g. users will feel ashamed of having less followers than others. Moreover, user-generated content requires users to share information (Dellarocas, 2003). Apart from the messages actively posted by the users, insights into users´ "interaction preferences" is essential to know more about the users´ psychological state - for instance, what motivates them (not) to share this information (Mosteller & Poddar, 2017). Therefore, the privacy threat is one of the biggest negative effects of social media engagement. Not only the institution operating the platform has access to the users´ personal data, third-party companies and peers are also considered as potential misusers of data (Jozani et al., 2020). Personal data like users´ locations, identities, online purchases, and shopping preferences can be easily tracked (Khanna, 2015; Jozani et al., 2020; Zhang et al., 2017). Social media has become a terrain for the police or other investigators to monitor the participants, the exposure of personal details can even help the police or other investigators to track you. On some social media, content that they deem inappropriate will be censored and they might keep an eye on your future posts as well. Monitoring people on social media can

even help police to spot radicalized groups and prevent attacks (Trottier, 2012). It is argued that everyone has the chance to surveil other people on social media, however, the authority or the state institutions are still "the most powerful actors in the society and can undertake mass-surveillance" (Allmer, 2015, p.377). Thus, a lot of surveillance and censorship are centralized.

Above, I discussed both the advantages and risks of engagement in general. Next, I will discuss the social media engagement in health communication. According to Heldman et al. (2013), the health messages on social media can become a dialog that opens the door for collaboration between organizations and the audience, the better to address the health issues of the latter. For example, feedback can help the organizations to better tailor further information to the needs of the audience. Social media has emerged in health communication as a way of improving the community engagement. However, community engagement is not a new notion and has been discussed in public health even before social media were around (ibid.). In public health, community engagement is defined as "the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people" (Heldman et al., 2013, p.5; CDC, 1997). In this context, social media help in building and sustaining networks, as well as building trust and mobilizing communities; the special benefits of social media are that they can target a very broad audience, and enable formation of self-selected communities (individuals that group around a given issue) (Heldman et al., 2013). However, the engagement could also cause tragedies. As I mentioned in the introduction, eight people in China got admonished because they sent WeChat messages warning people of the virus looks like the SARS and asked them to take protective measures. Their behaviour of sharing messages was considered as "spreading disinformation". The police managed to censor their messages and issued formal written warnings to them according to their private details on social media. In a health crisis, if the authority is very careful about the public opinion and has a very strict restriction on the dissemination of disinformation and misinformation, social media engagement can also get individuals into trouble.

3.4 Virality on social media

The discussion of virality on social media is mostly based on Liu, Lu and Wang (2016) 's work '*When Health Information Meets Social Media: Exploring Virality on Sina Weibo'*. The authors discussed the virality of the messages on social media as follows. Interactive behaviours such as retweeting, liking (favoriting) and replying make it possible to evaluate the effectiveness of health communication. The behaviours above can be summarized under the term "virality", which has been defined by Alhabash and McAlister (2015). According to this definition, virality can be divided into three dimensions: "viral reach, affective evaluation and message deliberation" (Liu et al. 2016, p.1). The first one is the number of users who share/retweet something, the second assesses the affective response by users, such as likes, and lastly, message deliberation describes the discussion of content by users – e.g. in the form of comments (ibid.).

Each of the behaviours can have various motivations: Retweeting, for example, is not only being used with the intention of spreading information, it can also serve to develop and maintain relationships (Boyd et al., 2010) or to express agreement and show support (Recuero et al., 2011). To avoid confusion, some users specify in their profiles that retweeting does not mean they agree with the opinions expressed in the post (Metaxas et al., 2014). Even liking something on Facebook can have a variety of motivations, such as self-promotion or expressing gratefulness (Gorrell & Bontcheva, 2014).

Liu et al. (2016) discussed four dimensions of virality on social media. First, the functions of retweeting, replying, liking and hashtagging enable the users to express their opinions and communicate with the health organization or other institutions, which changes the relationship between the authority and the public (Liu et al. 2016). In a way, it empowers the users to participate in health topics and relevant communications on social media. Therefore, "It also breaks down the monopoly of authorities on information and knowledge, and contributes to developing a less hierarchical approach in which authority sources are more diffuse" (Castells, 1996; Lash, 2002; Liu et al. 2016, p.2). Authority here refers to how trustworthy a source is in the user's opinions. Important factors determining authority are

whether professional sources are cited in a post, and the affiliation of the account that did the posting, these two can be summarized as professional authority (Fritch & Cromwell, 2001, Liu et al.,2016). Besides, Lee and Sundar (2013) introduced the concept of bandwagon as a description of the tendency of people to trust those opinions that are already supported by many others. This behaviour is most visible when people are dealing with plenty of information, as is the case on social media (Sundar, 2008; Bonabeau, 2004). According to Liu et al. (2016), the bandwagon effect is augmented on social media, whereas contributions by professional authorities (document and affiliation) tend to be undermined.

Second, the line between private and public affairs is blurred on social media, as private matters are made publicly visible (Papacharissi, 2010). The dangers of this have been highlighted, for example, by the Cambridge Analytica scandal, where private information from Facebook was illegally used without the knowledge of the affected persons. The privacy aspect is however seldom examined in studies about health information. Chew and Eysenbach (2010) suggested that public news are more likely to get shared and get engaged in by the public, while personal experiences are less frequently retweeted. The public-private standpoint is also used to explain interactive behaviour on social media. Retweeting is considered as "a public sign of approval" (Liu et al. 2016, p.3), while liking (favoriting) serves as a more private approval or acknowledgement (Meier et al., 2014).

Third, the blurred boundaries between private and public furthermore bring up the question of how to deliver health messages. Traditionally, public discussions were based on rationality and logic, whereas personal experiences and emotions were reserved for private life (Barbalet, 1998; Lash, 2002). Now, health communication professionals face the choice of supporting their claims with either statistical evidence or narrative evidence. The former focuses on statistical, quantitative information, while the latter tells a story in order to illustrate individual cases (Liu et al., 2016). It remains a controversial topic which of the two has more persuasive power (Reinard, 1988; Reynolds & Reynolds, 2002).

Last, the effects of social media also carry into choosing incentive appeals. As argued by Liu et al. (2016), health messages can either use negative appeals, where people are confronted with harmful outcomes of the threat or incorrect behaviour, or positive appeals, which show

the positive outcomes of healthy behaviour. Research indicates a facilitated spreading of negative sentiments and information due to word of mouth (WOM) on social media. For example, it was reported that retweeted news on twitter are more likely to be negative (Hansen et al., 2011). Research on Weibo shows similar trends: Yu (2011) revealed that the proportion of negative information is approximately 70%, while Zhang (2016) found that posts containing negative sentiment are more frequently retweeted. However, O'Keefe & Jensen (2009) concluded that positive appeals are more likely to improve the persuasiveness of health messages and cause more engagement by conducting a meta-analytic review. As for the effectiveness of these two types of appeals, so far no consensus has been reached among scholars.

4. Methodology

The research was designed as deductive research by using the CERC framework as a basic framework. A mixed-method strategy was considered to be the most appropriate to fulfil the requirements of the research. All the data was collected via a Weibo application programming interface (API). I conducted a content analysis to examine the Weibo posts based on CERC framework using both quantitative and qualitative approaches. The social media engagement data were further processed with Excel and a short Python code to extract and sum up the numbers of retweets, comments and likes. The results were analyzed with the help of Liu et al. (2016)'s theory on virality on social media.

4.1 Case Study

My research examines social media communication in a specific health crisis - the Covid19 outbreak in China. Therefore, the research design heavily depends on the case study. As Stake (2005) points out: "Case study is not a methodological choice but a choice of what is to be studied" (p. 443), distinguished from other research by focusing on one or a couple of cases bound to space and time (Gentles et al. 2015; Hancké 2009). As a research approach, the case study approach is not a specific research method, as the data collected of one case

always come from multiple sources of information, each with its own sampling, data collection and analysis methods (Boblin et al., 2013).

Case studies are a valuable tool that allow us to develop a comprehensive understanding by analysing a situation from the perspective of the involved people (Stake, 1995, 2005, Merriam, 1988, Yin, 2009). A case study is an ideal approach for social science research on a particular problem happening among a specific group of people. Therefore, I design my research based on an in-depth case study about the communication between health communicators and audience on Weibo during the Coronavirus outbreak.

4.2 Using API for the data collection on Weibo

Social media companies make use of so-called application programming interfaces (APIs) to collect large amounts of data that allow them to refine and monetize their products. Oftentimes, these APIs are also made available to third parties, allowing users access to the data banks on users and usage patterns (Lomborg & Bechmann, 2014). This makes APIs a valuable tool for investigators to gather data from a given social media platform: With the help of small software scripts, they can "retrieve, store, and manipulate digital traces left by the users of a service for further empirical analysis" (Lomborg & Bechmann, 2014, p.256). Lomborg and Bechmann (2014) also point out that APIs provide great opportunities for "online research of both quantitative and qualitative nature" (p.256). Part of the reason why API-based research is so attractive is that a great deal otherwise tedious work, such as collection and organization of data, can be automated. Collecting digital footprints is interesting as it allows access to usage patterns (e.g. communication and connectivity) in more detail than is possible by more traditional methods. The perhaps greatest advantage API-based network analysis is the visualization of patterns from large sets of relational data, such as thematic threads or the diffusion of posts (Hansen, Shneiderman, and Smith, 2011; Lomborg & Bechmann, 2014).

In my case, I collected 5306 posts from Weibo with the assistance of GooSeeker, a Weibo application programmer's interface. I gathered posts from targeted Weibo accounts: **People's**

Daily, CCTV News, **Communist Youth League Central Committee** and **Ziguang Pavilion**, to address my RQ1.

***Table 1**: General Information about the Weibo Accounts*

Account	**Mass Media Institution/ Political Institution**	**Follower**
People's Daily	the official newspaper of the Central committee of the Communist Party of China	116 million
CCTV News	the news media of CCTV (China Central Television), China's main state broadcaster	109 million
Communist Youth League Central Committee	the youth organization of the Communist Party of China	13.09 million
Ziguang Pavilion	a monthly political magazine sponsored by the Communist Party of China	10.74 million

According to Zhiwei Data (2020) and National Health Commission of the People's Republic of China (2020), the popularity of the coronavirus related events are presented as follows:

***Table 2**: The average popularity of the coronavirus related events on Weibo*

Time	The average popularity of the coronavirus related events on Weibo
2019.12	59
2020.01	64
2020.02	65
2020.03	61

(*Data From Zhiweidata http://xgml.zhiweidata.net/?from=banner#/)*

Zhiwei Data (2020) has calculated the popularity of influential coronavirus related events on Weibo from 2019.12 to 2020.3. It gathered and selected ten billion Weibo messages and computed the weighted average. Data normalization and other sophisticated statistical

techniques were used to process the data. The popularity was rated on a scale from 0 to 100, 100 being the most popular. According to the results of every event, I calculated the average of each month. The final results show us that the coronavirus related events were more prevalent in January and February. Therefore, all the messages for this study were selected between 2020.1.1 and 2020.2.28 from those four Weibo accounts as described above.

It has been suggested to use the number of likes, retweets and comments as an assessment of engagement on social media (Baym, 2013). The API also offered me the possibility to track the social media engagement data on Weibo. I collected the amount of retweets, comments and likes of every message via API at the same time.

4.3 Analysis of the posts

According to Prasad (2008), content analysis is "the study of the content with reference to the meanings, contexts and intentions contained in messages" (p.1). In the past, content analysis was conducted to analyze fictions, journal articles, newspapers, even obituary notices (Chai, 1978; Taviss, 1969; Loy, 1979; Devi Prasad et. al., 1991). With the development of social media, social media messages have also become a possible analysis object for researchers to fulfill their research goals. Besides, substantial numbers of social media posts can be gathered all at once and be quantitatively analyzed due to the advance of application programming interfaces and multiple coding programmes. To fulfill my research goal, I used a mix-method content analysis to examine the social media posts. The quantitative analysis method will be presented first, followed by a description of the qualitative analysis method. Quantitative analysis served for answering **RQ1a –** *what roles do the state-owned media play in health crisis communication in terms of the messages they delivered on Weibo* – by examining the numbers and proportion of sensemaking messages and efficacy messages in the total coronavirus-related messages. The presence of sensemaking messages and efficacy messages might show us how much they contributed to providing useful and helpful information to people in a health crisis. Furthermore, the quantitative analysis also went deeper into different subcategories under sensemaking messages and efficacy messages so that we can have a look

at what each account's focus was in health crisis communication. Given below is the process of the quantitative analysis:

Through the application programmer's interface, a total of 928 posts, 1128 posts, 1460 posts, and 1790 posts were collected from the **Communist Youth League Central Committee**, **Ziguang Pavilion**, **CCTV News** and **People's Daily**, respectively, (all of their posts between January and February).

Among the 5306 posts, 3801 posts were selected for further coding using four sets of search terms: *coronavirus (COVID-19), outbreak, pneumonia, Wuhan, infection*. 483 posts, 646 posts, 1239 posts, and 1433 posts were selected from the **Communist Youth League Central Committee**, **Ziguang Pavilion**, **CCTV News,** and **People's Daily**, respectively.

Table 3*: General information about the posts*

Posts between 2020.1.1 and 2020.2.28			
Account	**In total posts**	**Coronavirus related posts**	**Percentage of corona posts out of total**
Communist Youth League Central Committee	928	483	52%
Ziguang Pavilion	1128	646	57%
CCTV News	1460	1239	85%
People's Daily	1790	1433	80%

The coding scheme of the posts was designed based on the CERC framework. The categories of the coding were also inspired by Vos and Buckner (2016). In their research on analyzing Twitter tweets in the H7N9 outbreak, they split the data into two main categories: sensemaking and efficacy. They also divide the sensemaking messages further into

subcategories. I follow a similar approach, splitting both sensemaking and efficacy messages into subcategories.

The coding was conducted using a content analysis software, KH coder. It offers the capability to identify themes in unstructured data sets and develop codes based on individual words/word combinations/categories/documents. Apart from the data, KH coder requires an input text file specifying the rules according to which the data will be sorted. In order to develop appropriate sets of rules, I identified keywords by deconstructing health information into the sensemaking and efficacy categories, and further into a total of 7 subcategories. First, all the keywords were applied at the same time to give the total amount of health messages. Second, the keywords were split into the two main categories to find the proportion of messages belonging to each one. Last, keywords from each subcategory were used separately for an even deeper level of analysis. The details will be explained below.

Sensemaking. Posts containing information that helps the public understand what is going on and teach them about the nature of the disease are considered as sensemaking messages.
Guided by Weick's (1996) description, posts in the sensemaking category encompass users developing a deeper understanding of the disease, e.g. by comprehending the situation or identifying patterns of events (Vos & Buckner, 2016). It is also argued that a feasible strategy of sensemaking should draw upon an available memory to evaluate the emerging crisis by recalling a relevant event that occurred in the past, and thus placing the emerging one into a framework (Hertwig et al. 2005; Sutton & Woods, 2016). Also included are posts contributing to assessing the current situation, both in terms of the extent of the crisis, such as numbers of infected and deceased, as well as progress in fighting it, such as news on the development of cures (ibid.).

Sensemaking messages contain the themes placing the crisis in a framework, helping people to make sense of what is/was happening in the crisis by giving details to the public, informing people of the vaccine development, and refuting the nonfactual information. Placing the crisis in a framework means associating the current virus outbreak with other similar crisis that has happened before; in this case, COVID-19 has been compared to SARS and the Flu. So the posts including "SARS", "Flu" were coded into the category "**placing the crisis in a**

framework". In the sensemaking process, it is essential to help people comprehend the situation by reporting the details of the disease, for example, the number of the cases/deaths, the way of transmission, the proven symptoms and the possible sequelae after cured. Given this, the posts including either "cases" or "confirmed" or "cured" or "new" or "death" or "transmission" or "symptom" or "sequela" were coded into the category "**comprehend the situation**". The vaccine and medicine development is also considered part of sensemaking, so posts including "vaccine" and "medicine" or "pathology" were coded into the category "**vaccine/treatment development**". Given the openness of social media, the spread of disinformation/misinformation is seen as a problem which affects the sensemaking process. Therefore, refuting rumours might be one of the strategies pursued by official state-owned media accounts. So the posts which contain "rumour" or "nonfactual information" or "disinformation" or "misinformation" were coded into the category "**refute the nonfactual information**".

Efficacy. Posts in the efficacy category contain information encouraging individual action against the disease (Reynolds, 2006; Reynolds & Quinn, 2008). Prominent examples are "disease control instructions like hand washing and cough covering, cooking instructions and travel advice" (Vos & Buckner, 2016, p.304).

Information provided in the efficacy messages included disease control instructions, daily life advice, and travelling advice. According to my own coding rules, disease control instructions are considered as something people usually don't do but have to do now to control the spread of the disease. As a result, posts including either "precaution", "wearing masks", "social distance", "quarantine", "shut down", "work from home" or "online classes" were coded into the category "**disease control instruction**"; Daily life advice are suggestions for daily habits that contribute to your health and well-being, the posts that contain "daily habit" or "hand washing" or "cough covering" or "hygiene" or "disinfection" or "mental health advice" were coded into the category "**daily life advice**". The last subtype is **travel advice**, it includes the posts which contain "travel", "exit the country", "enter the country" or "flight".

Some posts were coded into more than one category. I kept them in both/all the categories for further analysis. In the results section, both some example posts which are randomly chosen

from the materials, as well as the numerical results from the coding will be presented. The following analysis part considers both these types of information.

Next, I conducted a qualitative analysis of some of the material to address **RQ1b -** *how is the quality of the messages***.** The qualitative data analysis method is more descriptive and communicative. It allows the researcher to break down the material into meaningful inferences (Bhat, n.d.). Therefore, I conducted qualitative data analysis to have a more comprehensive understanding of the quality of the messages. Also, some of the comments and images were analyzed to support the discussion. The qualitative analysis represents a more detailed description of the messages under each subcategory, considering the context. As argued in the theory part, the CERC framework suggests a strategic health communication involving (1) relevance: how are the messages related to this specific health crisis (2) accuracy: do the messages convey the information accurately to the public so that they will not further confuse the public, and (3) intelligibility: are the messages clear enough and easy to be understood by the public, to improve the health of the public (Bernhardt, 2004). Thus, considering the practical data, the analysis was designed to discuss the quality of the messages from the perspective of communication strategy, accuracy, relevance and intelligibility.

4.4 Analysis of social media engagement

The analysis of social media engagement aimed to answer **RQ2 -** *how is the public engaged with the health messages on Weibo?* With the goal of finding the frequency of different engagement behaviours in different categories, I calculated the average number of retweets, comments, likes for each category. This also allowed me to analyze the relationship between engagement and message virality. The process of the analysis is presented below:

The output of the API was an excel spreadsheet, where different kinds of information were separated into different columns. The coding program only sorted and output data from the column containing the posts. Afterwards, it would be a tedious manual process to find the

social media engagement data corresponding to each of the posts. Therefore, I first created another column in the excel document with the equation

=CONCATENATE(K2;", retweets";O2;",comments";P2;",likes";Q2)

giving a single column containing the posts as well es corresponding engagement data, each number preceded by its description, and separated by commas from the other numbers. Coding the new column, therefore, placed the social engagement numbers into the same categories as the posts. A short python code was then written to extract and sum up these numbers.

```
import re

file_list = []
f = open("data.txt", 'r')
for line in f.readlines():
    for element in line[0:-1].split(','):
        file_list.append(element)

subs = ["retweets","comments","likes"]
results = [0, 0, 0]
for l in range(3):
    for s in file_list:
        if subs[l] in s:
            temp = [int(num) for num in re.findall(r"\d+", s)]
            results[l] = results[l] + temp[0]

print("Retweets: ",results[0],", Comments: ",results[1],", Likes: ",results[2])
```

(***Figure 1****: Screenshot of the Python-code used for extrcting social engagements numbers from the coded posts.*)

4.5 Reliability

As the coder can sort the same post into several categories, care has to be taken when interpreting the results. For example, summing up percentages of sensemaking subcategories overestimates that of the sensemaking category. I avoided such double-counting by performing the coding "top-down", as explained in the methods part. To assess the coding reliability, I manually coded 50 posts which were randomly selected from the raw material and compared the result with the automated coding result before coding all of the material. The deviation was small. The automated coding coded one more post into sensemaking messages and one more post into efficacy messages. All the other posts were placed in the

same category and subcategory. To reassure the reliability in the process of coding, I randomly selected 2% of the data set from each category and posts that coded in more than one category and checked them by manually coding them. I adjusted the coding rules to make the deviation as small as possible.

4.6 Validity

To answer RQ1, the posts were analyzed in terms of the CERC framework, which was composed by the WHO to guide health communication professionals. While there may be alternative approaches to health communication that can be effective, CERC covers a wide range of contents that can help in a health crisis and coding according to this framework is expected to identify most of the productive messages. Therefore, the content of health messages calculated in this way is a good indicator for the degree to which the accounts act as health communicators. Further analysis of the individual posts made it possible to develop a deeper understanding of the underlying strategy of the different accounts, such as their individual motivation for posting health messages.

As for RQ2, rather than analyzing the engagement qualitatively – almost impossible, given the large number of comments – the interaction numbers were analyzed on a quantitative basis. Even though this approach didn't capture the feelings of individual users, it did a great job quantifying the users' engagement with the posts.

4.7 Limitations

The research data collection and analysis heavily depended on the API and coding programme, the proficiency of using these programmes might have an impact on the accuracy of the results. Since I conducted the research on my own, the coding was done by one person without taking any measures - such as asking a coauthor to code the posts according to his/her coding scheme - to prevent subjective factors from having too much effect on the coding. The coding scheme could be made more objective by having more than one person do the coding in further research.

Besides, all the posts presented in this thesis were translated from Chinese to English. The differences between the languages might cause some of the original meanings to be lost in translation. Nevertheless, this limitation is not significant for the result of the analysis.

The methodology decides that the research is approached from the perspective of the message sender since the research examined the organizations' posts on Weibo. The investigation of message engagement relied on the numerical data of engagement behaviours on Weibo. Although it is enough for fulfilling the research goals, the results could benefit from interviewing the audience or even the operators of the accounts. When I was first designing the research, I was thinking of conducting in-depth interviews with the audience and the operators of the four accounts. There are two reasons I eventually chose not to do the interviews: The risk of the interview is the reliability of the interview data; it not only relies on the interviewees' integrity but also on their professionality in this field. The content from Weibo is more objective evidence for the communication in the coronavirus outbreak, and the result of the analysis is more applied to the situation independent of anyone's personal feelings. Secondly, I didn't get any response from the accounts' operators, and I didn't want to recruit the interviewees from my social networking because they are not truly experts in this research field.

5 Results and analysis

5.1 A brief overview of the results: Social media as a medium for sensemaking and efficacy

After an initial look at the numerical results to establish the general trends, this chapter will examine each of the subcategories in detail. Each type of message has characteristic functions, and by analyzing how much attention different accounts pay to the different types of messages, conclusions can be drawn about their communication strategies.

For easy comparison, the numerical results are summarized in table 3; examples for posts in the different categories can be found in table 4. First of all, the percentage of all health messages (sensemaking messages plus efficacy messages) among all coronavirus-related

posts is shown. While less than half of Youth league's coronavirus related posts are considered health messages, and only slightly more than half of Ziguang Pavilion's, both news agencies boast two thirds of health messages (39.54%, 57.12%, 67.63% and 67.83% for the Communist Youth League Central Committee, Ziguang Pavillion, CCTV News and People's Daily, respectively).

Approximately 37.6% (n=1431) of the posts did not reflect sensemaking or efficacy information. These posts didn't contain enough straightforward information, thus are difficult to be categorized. For example, posts that mention the virus or the outbreak but didn't give any specific useful information and were not coded to any category: "*The secretary-general of the United Nations were grateful to Chinese people for their contribution to all human beings during the outbreak"*. Other messages about the government mandates were also found difficult to be coded into any specific category: "*Please spread this message! Hubei province government has announced the way of reporting problems in epidemic prevention and control"; "Flash! Tang Zhihong, the director of the health committee in Huanggang, has been dismissed due to the mistakes he made in the outbreak"*. For those messages, since they only have news value and they cannot contribute to health communication, they were excluded from the result.

Next, it is instructive to look at how the health messages are distributed into sensemaking and efficacy messages. To be more specific about the proportion of sensemaking messages and efficacy messages, *Communist Youth League Central Committee* had the least posts in both sensemaking messages and efficacy messages (21.74% and 23.40%). Sensemaking messages and efficacy messages made up 35.29% and 29.57% of the total virus-related messages posted by Ziguang Pavillion. Both CCTV News and People's Daily show a higher proportion of health messages. Sensemaking messages made up 52.78% and efficacy messages 29.25% of all the posts by CCTV News. The percentage of sensemaking messages and efficacy messages in People's Daily is 50.59% and 29.76%, respectively. In total, there are more sensemaking messages (n=1712) than efficacy messages (n=1094). However, if we look at the ratio of sensemaking messages and efficacy messages of each of the four accounts separately, it is worth noting that the percentage of those two kinds of messages was very similar for the government affairs accounts (*Communist Youth League Central Committee*

and *Ziguang Pavillion*), while the state-owned media accounts (*CCTV News* and *People's Daily*) posted much more sensemaking messages than efficacy messages over the same period. This reveals that the government affairs accounts put the same effort into delivering both messages, however, the news agencies had a clear preference for sensemaking messages. As the government is the central coordinating power, it makes sense that their focus is shifted more towards instructing the public on how to behave properly, while the media, for the most part, limit itself to informing.

The messages were further grouped into seven subcategories. Sensemaking messages where placed in the following subcategories: place the crisis into a framework, comprehend the situation, vaccine/treatment development, and refute the non-factual information. The subcategories for efficacy messages where the following: disease control instruction, travel advice and daily life advice. The detailed distribution will be discussed more below; here, it is sufficient to notice that among all of these, the messages related to comprehending the situation account for the biggest number (93%) of the sensemaking messages; the messages concerning disease control instructions represent the biggest part (61.3%) of the efficacy messages.

While there are some differences between the different accounts, it quickly becomes apparent that all four accounts posted a significant amount of sensemaking messages and efficacy messages during the crisis, indicating that social media provides a forum where the organizations can deliver health messages, and where the public can make sense of the crisis as well as build up the confidence in their ability to overcome the difficulties. This use of health messages fulfils the crucial needs for health communication as outlined by the CERC framework (Veil et al., 2008).

***Table 4**: Numerical results (percentage out of coronavirus messages of each account)*

	Sensemaking messages (n=1712)				***Efficacy messages (n=1094)***		
	Placing the crisis in a framework	Compre-hend the situation	Vaccine/treatment develop-ment	Refute the nonfactual information	Disease control instruction	Travel advice	Daily life advice
Communist Youth League Central Committee (n=483)	n=191 or 39.54%						
	n=105 or 21.74%				n=113 23.40%		
	n=4 or 0.83%	n=66 or 13.66%	n=12 or 2.48%	n=28 or 5.79%	n=84 or 17.39%	n=6 or 1.24%	n=33 or 6.83%
Ziguang Pavilion (n=646)	n=369 or 57.12%						
	n=228 or 35.29%				n=191 or 29.57%		
	n=10 or 1.54%	n=208 or 32.20%	n=5 or 0.77%	n=12 or 1.86%	n=139 or 21.52%	n=19 or 2.94%	n=48 or 7.43%
CCTV News (n=1239)	n=838 or 67.63%						
	n=654 or 52.78%				n=363 or 29.25%		
	n=5 or 0.40%	n=632 or 51.01%	n=18 or 1.45%	n=2 or 0.16%	n=200 or 16.14%	n=57 or 4.60%	n=163 or 13.16%
People's Daily (n=1433)	n= 972 or 67.83%						
	n=725 or 50.59%				n=427 or 29.76%		
	n=15 or 1.05%	n=686 or 47.87%	n=19 or 1.33%	n=10 or 0.70%	n=248 or 17.31%	n=55 or 3.84%	n=175 or 12.21%

Remark: *In each account, the SUM of sensemaking messages and efficacy messages do not equal to the total number of the messages. It is because some messages fall into both sensemaking and efficacy categories.*

***Table 5**: Examples of posts (Random examples from the materials)*

Sensemaking

Placing the crisis in a framework

- Wuhan government held a special meeting, requiring to construct a special hospital in Wuhan staff sanatorium, according to the model of Beijing XiaoTang Mountain hospital during the SARS outbreak in 2003. (Communist Youth League Central Committee).
- SARS virus and COVID-19 virus are 85% homologous. (Ziguang Pavillion)
- This morning, the press office of Guangzhou municipal government held a ventilation meeting to report on the prevention, control and treatment of the epidemic in Guangzhou medical university. Academician Zhong Nanshan attended the meeting to review the experience of fighting against SARS in Guangzhou in 2003, introducing the prevention and treatment of the epidemic in Guangzhou and answering questions from journalists. (CCTV News)
- Scientist Zhong Nanshan: novel coronavirus will not cause frequent outbreaks like the flu. (CCTV News)

Comprehend the situation

- The clinical manifestations of COVID-19 were fever, fatigue and dry cough. (Communist Youth League Central Committee, Ziguang Pavillion)
- The country has reported 14,380 confirmed cases, 2,110 severe cases, 304 deaths and 19,544 suspected cases by February 1st. (Ziguang Pavillion)
- The number of suspected cases nationwide has dropped for 11 days. The number of newly confirmed cases outside Hubei province dropped continuously for 16 days, and the number of newly confirmed cases in many regions was 0. The cumulative number of cured and discharged patients in Hubei exceeded 10,000. (CCTV News)
- The director of the Ministry of science and technology said: aerosol transmission is only possible under three conditions at the same time: airtight space, a long time, and high concentration of virus. In a well-ventilated environment, the possibility of aerosol dissemination is very small. (CCTV News)
- Feng, The researcher in Chinese centre for disease control and prevention, said: The virus is extremely unlikely to infect people through contaminated clothing. (CCTV News)
- By February 25, a total of 555 cases had been confirmed in five prisons in Hubei, Zhejiang and Shandong provinces, including 19 suspected cases and four severe cases, according to Xiong Xuan Guo, vice-minister of justice. (People's Daily)

Vaccine development

- The Chinese CDC has started the development of a vaccine for coronavirus. (Communist Youth League Central Committee)
- The fastest vaccine candidate targeting the novel coronavirus is expected to begin clinical trials in late April, according to Xu Nanping, vice-minister for science and technology. (CCTV News)
- Song Zhiheng, deputy director of Zhejiang provincial science and technology department, said the first batch of vaccine has produced antibodies and has entered the animal testing stage. (People's Daily)

Refute the nonfactual information

- “Trump exempted China from drug patent for treatment of coronavirus? It’s not true” Since yesterday afternoon, the news has gone viral on Weibo and further spread to various online forums. However, it was not true. (Communist Youth League Central Committee)
- A man was detained for 10 days after fabricating a rumour that more than 3,000 new cases had been confirmed in Shanghai. (Ziguang Pavillion)
- Academician Zhong Nanshan was infected? Cars with foreign license plates are not allowed to enter Shanghai? Did Chengdu shut down the highway? Can the gargle of salt water prevent novel coronavirus? ...Have you heard any of these? These are all nonfactual information. (People’s Daily)

Efficacy

Disease control instruction

- For workers: Reduce meetings and gatherings. Wear masks and take away the meals from the cafeteria. (Communist Youth League Central Committee)
- Chang'an university subsidized the impoverished student Internet data fee to make sure that they can take online courses from home. (Communist Youth League Central Committee, Ziguang Pavillion)
- “National health commission gave you 4 tips of personal hygiene” (1) You must wear a mask, sneeze with a handkerchief or paper to cover the mouth and nose; (2) Wash hands frequently; (3) If you are not careful to cover your mouth and nose with your hands, you must wash your hands after a sneeze;(4) do not rub the eyes or touch the mucous membrane after sneezing. (Ziguang Pavillion)
- If you had close contact with a confirmed patient, you need to quarantine yourself at home and your family should also take precautions. (CCTV News).

Daily life advice

- “Do I have to disinfect everything I bought from the supermarket?” Feng Zijian, an expert in disease control, said it is not necessary, but people should wash hands frequently. (Ziguang Pavillion)
- There is no need to disinfect the sole in daily life, just keep it clean. It is recommended to change shoes at the door after going home, according to Feng Luzhao, the researcher in Chinese centre for disease control and prevention. (CCTV News)
- During the outbreak, you may pay special attention to the various changes in your body and always suspect that you are sick. Want to wash hands and disinfect all the time? Anxiety and suspicion are common emotional reactions in the epidemic situation. How to carry out psychological adjustment? How can different people adjust themselves? #4 psychological adjustments during an outbreak# (People’s Daily)

Travel advice

- Tourist groups are forbidden in Wuhan… (Communist Youth League Central Committee)
- Urgent notice! Wuhan 2020 Spring Festival cultural tourism activities have postponed. (Ziguang Pavillion)
- The reporter learned from the ministry of culture and tourism that the ministry of culture and tourism issued a safety alert for travelling to the United States. Recently, Chinese tourists have been unfairly treated in the US due to excessive epidemic prevention measures and the security situation in the US. The ministry of culture and tourism suggests Chinese tourists raise safety awareness and avoid travelling to the United States. (People’s Daily)

5.2 Sensemaking messages

The results show us that sensemaking messages account for a bigger slice of health messages than efficacy messages. Earlier studies pointed out how using social media can have a great impact on helping people understand a situation and therefore better prepare them for what might come (Reuter, Heger, & Pipek, 2013). This study provided empirical evidence for the argument that social media is a medium for sensemaking messages in an emergency crisis. Next, I will take some representative posts as examples from each subcategory to further examine the quality of the messages in the social media environment.

5.2.1 A small number of the messages placing the crisis in a framework

Placing the crisis in a framework means associating the current crisis with other events. The findings indicated that few messages (n=34) associated the current outbreak with old experiences such as SARS or the flu on Weibo. Examples are shown below:

> ***CCTV News****: This morning, the press office of Guangzhou municipal government held a meeting to report on the prevention, control and treatment of the epidemic in Guangzhou medical university. Academician Zhong Nanshan attended the meeting to review the experience of fighting against SARS in Guangzhou in 2003, introducing the prevention and treatment of the epidemic in Guangzhou and answering questions from journalists.*

> ***CCTV News****: Scientist Zhong Nanshan: novel coronavirus will not cause frequent outbreaks like the flu.*

> ***CCTV News****: The progression of COVID-19 is faster than SARS, according to Tong Chaohui, an expert in medical rescue.*

Although, according to Hertwig et al (2005), it is an effective strategy to draw upon an old experience to evaluate the new unfamiliar situation, it doesn't seem like a prevailing tactic on Weibo. On one hand, the recall of the relevant event assist the public to evaluate the current crisis; on the other hand, too frequent recall of the old crisis could cause panic among people when they were still not familiar with the emerging crisis since the experience of a crisis

always cause a sentiment of horror and sadness. Research also has indicated that "the word of mouth (WOM) of social media facilitates propagation of negative information and negative sentiment" (Liu et al., 2016, p.3). The prevalence of negative information/sentiment would hinder people to establish the confidence of overcoming difficulties.

5.2.2 Comprehending the situation - the accuracy of statistical data

The large number of messages in this subcategory (n=1592) shows that a lot of the sensemaking messages were posted to assist the public achieve a more comprehensive understanding of what is going on around them by reporting the details of the virus and disease. Furthermore, the overwhelming majority of the health messages posted by the news organizations (*CCTV News* and *People's Daily)* help the public comprehend the current situation by reporting the details such as the number of cases, the spread of the virus and the symptoms (51.01% and 47.80%).

One of the most important functions of sensemaking messages is to facilitate the participants to make correct decisions in unusual situations(Weick, Sutcliffe, and Obstfeld, 2005). Wherever people find themselves in a situation that is not included in the guidelines laid out by efficacy messages, sensemaking messages give people the knowledge required to make informed decisions about their behaviour on their own. Comprehend the situation messages serve this purpose particularly well.

The examples below show that the messages can give the public a good sense of correct behaviour by informing them of the details of transmission and symptoms. In this way, they also function as a theory for the empirical actions:

> ***Communist Youth League Central Committee****: Recently, the fourth edition of the medical plan was released. In the new version of the medical plan, there are 8 facts about the infection of COVID-19: (1) the main infection source is the infected patients (2) transmission by respiratory droplets is the main way of transmission, can also be spread through contact (3) All age groups are likely to get infected.*

> ***Ziguang Pavillion****: Wuhan children's hospital neonatal internal medicine experts consider the possibility of vertical transmission of maternal and infant infection which should be taken seriously.*
>
> ***Communist Youth League Central Committee*** *and* ***Ziguang Pavilion****: The clinical manifestations of COVID-19 were fever, fatigue and dry cough.*

Frequently, posts also informed the public about detailed recent whereabouts of newly diagnosed patients so everyone can judge for themselves if they could have been in contact with those persons and should, therefore, take additional precautions:

> ***People's Daily****: Notification from Harbin CDC emergency: on January 23, from Hankou to Harbin west, G1278 train carriage No.2, three passengers from Wuhan were found with a fever, they were sent to the hospital. The 53 passengers in the same carriage should take precautions and stay at home.*

Access to the details of the confirmed cases, death and cured cases also assist the public to evaluate the current situation by themselves:

> ***Communist Youth League Central Committee****: By January 31, there are in total of 243 cured cases, and 72 new cured cases today.*
>
> ***People's Daily****: South Korea has confirmed 219 new COVID-19 cases, bringing the total number of confirmed cases to 3150.*

The statistical number was used a lot in the messages about the details of the cases and deaths. According to Allen (2017), the use of statistical evidence enhances the persuasiveness of a message, thus gaining more acceptance of the information from the audience. However, in health communication, the statistical inaccuracy and inconsistency with other sources become problems that could impede the public's perception. For example:

> ***CCTV News****: According to National Health Commission, Jilin City has confirmed two more cases on 2.18.*

However, at the same day, Jilin Health Commission announced five more confirmed cases on its official website. Different numbers have drawn public attention on Weibo. The users commented under the **CCTV News** post:

> *Please communicate clearly before you release the news. It was humiliating that you made such a mistake if the number was inaccurate.*
>
> *So the past data you told us was also likely to be inaccurate?*

Later, **CCTV News** released another message to clarify the situation:

> ***CCTV News**: The two confirmed cases in Jilin city were reported until 23.00 on 2.18, there were three more cases got reported during 23.00-24.00. Therefore, we corrected the new confirmed cases in Jilin city to five.*

As information senders, the accuracy of the message must be carefully considered before sending it to the public (Doyle et al.,2019). The wrong number of the confirmed cases might not directly influence people's life in the outbreak, but it is likely to impede the public's perception of the situation, as well, it could break the public's trust. Social media gives both good impact and bad impact on the consequence of inaccurate information. On one hand, it speeds up the dissemination of the inaccurate information; on the other hand, the instant feedback on social media allows the organization to hear the voice from the public or other sources, and revise the message quickly.

5.2.3 Vaccine and treatment development messages - the importance of intelligibility

In total, there are 44 messages which concerned the vaccine or treatment development, occupying a small proportion of the sensemaking messages. However, it does not mean that the messages related to vaccine/treatment development are not necessary. Conversely, those messages can make a significant consequence:

> ***Communist Youth League Central Committee*** **and** ***People's Daily:*** *January 31th,* Shanghai institute of medicine and Wuhan Institute of Virology discovered that Chinese patent medicine Shuang Huang Lian oral liquid could inhibit novel coronavirus!

The message was posted by *Youth League* and *People's Daily* on January 31th, informing the public that Chinese patent medicine Shuang Huang Lian could inhibit the virus. Social media make it easier to have such a conversation at scale and cause significant consequence much more quickly (Yammnine, 2020). The information went viral on Weibo in one day. The message posted by People's Daily got liked 1.32 million times, commented 80 thousand times and retweeted 56 thousand times. The message posted by *Youth League* got liked 110 thousand times, commented 17 thousand times and retweeted 12 thousand times. Some comments on January 31th are shown below:

> *The good news is that the medicine will be sold out tomorrow!*

> *How can it inhibit the virus? In what degree can it inhibit the virus? It's like someone said that he ate enough bread, so he had better immunity to the virus?*

> *How can you say this without clinical research? As a government Weibo account, you should take your responsibility.*

According to the comments, we see that people were confused, even upset about the information, although this is a piece of "good" news about the medicine development of coronavirus. It is presented in a very unclear way, and the messages do not contain any scientific explanation or proof. Some people were aware that this information could cause a panic buying of Shuang Huang Lian because something similar happened during the SARS outbreak. The Chinese patent medicine Isatis Root Granule was out of stock during the SARS outbreak due to similar ambiguous information, with slower dissemination of information back then. Due to the virality on social media, these messages led to a panic buying of Shuang Huang Lian and almost all the stores (offline and online) had run out of Shuang Huang Lian the next day. Thus the next day, both *Youth League* and *People's Daily* posted another message to respond to the last message, which caused a significant consequence:

Communist Youth League Central Committee **and** ***People's Daily:*** *February 1st, Inhibition doesn't equal to precaution and treatment! Please don't panic buy and take Shuang Huang Lian without doctor's prescription! This is still a preliminary research.*

On the one hand, the feature of social media allowed the organizations to respond quickly and amend the information according to the reaction of the public. On the other hand, the consequence could have been avoided if they made more clear explanations in the first place. "Inhibit" is defined as "to prevent sth. from developing in the way or to slow down a process of something" in Cambridge dictionary. In Chinese, it is even a more vague word to describe the function of treatment. Therefore, the word itself is ambiguous in the context (without further explanation). Besides, not all the people are capable of understanding "inhibit the virus" correctly, it's possible that people interpret Shuang Huang Lian as a medicine that can prevent them from getting infected. Moreover, since it was declared that there is no effective medicine for COVID-19, it could also cause confusion about this statement.

5.2.4 Refute non-factual information messages - the relevance to the virus

Earlier research has outlined that social media "can be intentionally manipulated to spread disinformation and rumours as well as unintentionally supply and spread incorrect information that can sometimes cause catastrophic consequences" (Abbasi & Liu, 2013; Liu et al., 2014). In order to counteract such processes, 52 messages from the four official media are about refuting non-factual information. When going more into detail and looking at the distribution of posts in the four accounts, one thing that catches the eye is a high proportion (5.79%) of "refuting non-factual information" in the Youth-league, compared to the other three accounts. Some examples are shown below:

Communist Youth League Central Committee*: "Trump exempted China from drug patent for treatment of coronavirus? It's not true" Since yesterday afternoon the news has gone viral on Weibo and further spread to various online forums. However, it was not valid.*

Communist Youth League Central Committee: *Since February first, a short article claimed that a flight from the United States to evacuate American citizens in Wuhan a few days ago had brought urgent-needed epidemic prevention and medical appliance to China, which was concealed by the Chinese government. This article was spreading on Chinese social media. However, it was found to be a rumour originated from overseas.*

> ***Communist Youth League Central Committee:*** *Recently, a man posted a Weibo saying that no one took care of the corpses in one public hospital in Wuhan with a video. The video was found to be dubbed and remade, and the message was not real. We appeal to the public not to create rumour, spread rumour and believe in rumour. If you find rumours, please tag it with #refute the rumour in the outbreak#, let's work together to clean up the online environment.*

As the name indicates, this is an account by and for younger generations. Arguably, this shows that these generations are more prone to circulating rumours, thereby creating the need for clearing up the misinformation to avoid panic. Previous studies also supported this argument, for instance, "A report on online rumour governance in 2018 in China" showed that more than 40% of the participants in discussing the events which were verified to be rumours afterwards were young people aged between 25 to 35 (SYSU and Tencent, 2019). The participants who were older than 45 made up less than 10% of the whole participants (ibid.).

However, we learned that not all the rumours they refuted helped the public make meanings of the emerging health crisis. For example, neither of the three examples I presented above has a lot to do with the virus itself. The first two are both refutations of the disinformation about what the United States did to China. The last one is to disprove the situation in the hospital in Wuhan. According to Zoller and Dutta (2009), the ability of sensemaking is interpreted in two measures: "being able to understand and coming to a new sense of what is important" (p.41). This kind of information that informed people of what was happening in the emerging crisis but is not really one can stand in the way of painting a clear picture about the current situation, even if as in this case merely by distracting from what is really important.

Speaking back to the nature of crisis communication, Murray-Johnson et al. (2001) argue that crisis communication initially is to inform the public of the facts of an unexpected emergency which might ruin an organization's reputation. Since the account serves for the Communist Party, one of its goals of crisis communication is to protect the party's reputation in the crisis. The first two posts in a way told people that the United States were not giving Chinese people a hand, they also encouraged the public to believe in their own country more than other countries, trying to build a good reputation of the authority. The third post also tried to

convince the public to be confident of the public hospital management and earn people's trust back in the government in the outbreak. Even though it does not have to do much with the virus itself, posts that try to make people trust the government can help to prevent panicking, and also makes the people more likely to follow the instructions and recommendations.

5.3 Efficacy messages

Efficacy messages provide a more practical guideline for the public to boost their self-efficacy and make them feel comfortable and confident in the situation. It is more of a next step after making sense of an epidemic outbreak to help people to respond to the health crisis appropriately. In total, the number of efficacy messages is smaller than sensemaking messages. The majority of the efficacy messages are disease control instructions and daily life advice.

5.3.1 Disease control instructions and daily life advice - familiarity breeds trust

Disease control instructions and daily life advice play essential roles in helping the public fight against the epidemic. The messages function as a practical guideline for people to behave correctly in the outbreak. Disease control instructions involve actions that people usually do not take but have to take now to control the spread of the epidemic, while daily life advice concerns people's daily habits more and aims to improve them for people's well-being. It is worth noting that when the organizations delivered the messages on Weibo, they tended to quote individual official/expert rather than institutions and often illustrated the information with the individuals' images or videos.

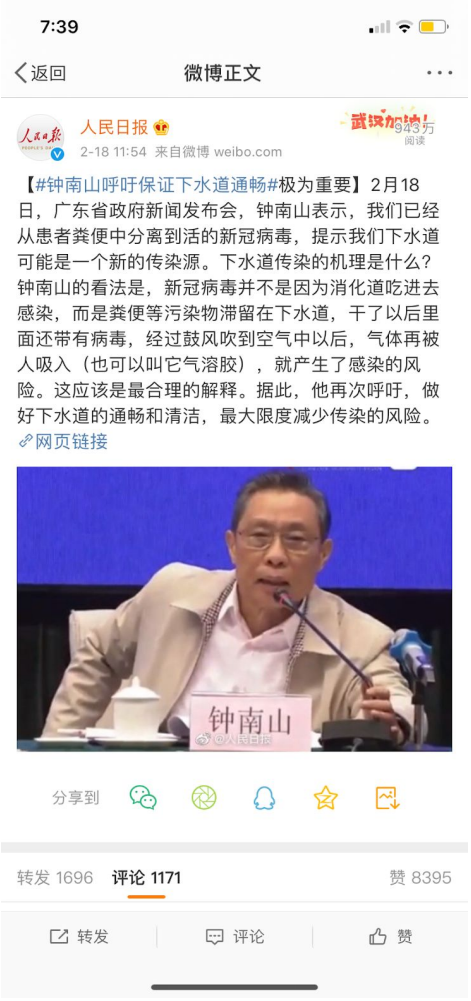

***Figure 2**: **People's Daily**: Zhong Nanshan: coronavirus strains were isolated from stool specimens of infected patients, so it's very important to make sure that the plumbing system runs smoothly and clean.*

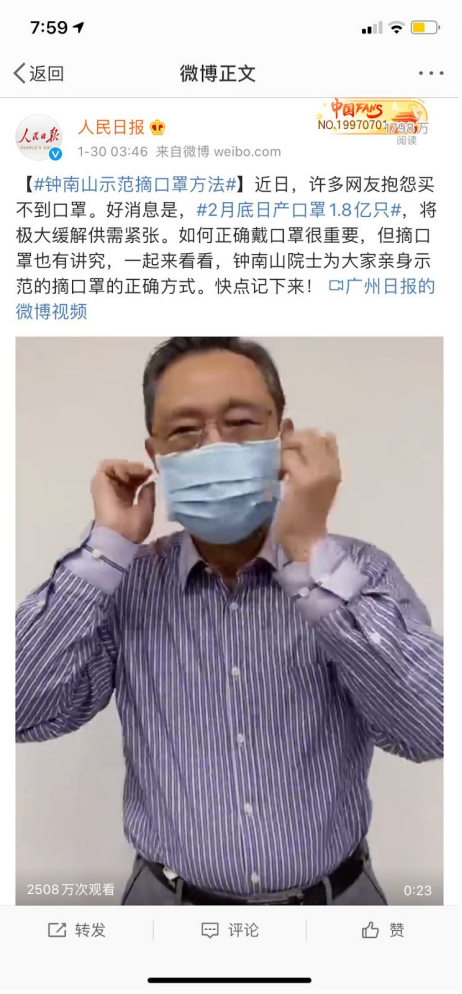

***Figure 3**: **People's Daily**: Zhong Nanshan demonstrated how to remove the mask properly.*

It is also argued in the *CDC's Field Epidemiology Manual* that during a health emergency, the presence of a lead spokesperson whom the public gets to know is necessary for the health communication – familiarity breeds trust (CDC, 2018). They outlined that the spokesperson should have a "single overriding health communication objective" and keep repeating it in the communication with the public (ibid.). Apart from this, the spokesperson should also "acknowledge concerns and express understanding of how those affected by the illnesses or injuries are probably feeling" to establish a common ground with the panicky people (ibid.).

Besides, the images and videos of the spokesperson wearing suits and giving a speech make the public subconsciously consider him/her to be more reliable, which strengthen the reliability of the messages. When they tried to inform the public of the disease control suggestion and advice for daily life in the outbreak, it also helped the public build up the confidence to conquer the epidemic.

It could also concern the idea that "social human interactions are based on emotional expressions" (Aldunate et al., 2018). Elements such as body gestures, prosody and facial expressions contribute to expressions of affective information which is crucial to understanding the communication (Van heijnsbergen et al., 2007). In this case, showing the spokesperson's face and body help eliminate distrust in a text-based conversation on social media and give dynamicity and emotional emphasis to the conversations (Feldman et al., 2017).

5.3.2 Travel advice

Travel advice can be divided into two types. One is advice on international travelling, based on health issues as well as human rights issues:

> ***People's Daily****: Our journalist learned from the ministry of culture and tourism that they issued a safety alert for travelling to the United States. Recently, Chinese tourists have been discriminated and unfairly treated in the USA due to extreme epidemic prevention measures and the security situation in the US. The ministry of culture and tourism suggests that Chinese tourists raise safety awareness and avoid travelling to the United States.*

The other one is tips for domestic travelling, including suggestions for not going to a specific area such as Wuhan city and Hubei Province and notifications about the decisions that have been made about travelling:

> ***Communist Youth League Central Committee****: Zhong Nanshan, an 84-year-old scientist, suggested the public not to go to Wuhan except for particular circumstances.*

> ***CCTV News**: "All group tours are suspended" According to the China association of travel agents (CTA), travel agencies and online travel companies across the country have suspended the group tours and "air ticket + hotel" products from today.*

The two sections above allowed as to assess the quantity and quality of health messages sent by the selected accounts. Coding according to the CERC framework revealed a significant amount of sensemaking and efficacy messages. Analysis of the content of selected posts showed that most of them contained fulfilled the requirements of aiding the public in the fight against the virus by providing useful information and valuable advice. However, we also found inaccurate and unclear messages, which can confuse the public. Also, corona-related posts which are not health messages can distract from what is really important. On the other hand, those messages often served to build trust in the government, which is also important since it makes it more likely for people to follow the health instructions from other posts. The analysis furthermore showed that the concept of "familiarity breeds trust" is frequently used as a communication strategy.

In the following section, social media engagement with the health messages of the four accounts will be analyzed. This can reveal important information about the effectiveness of the health communication.

5.4 Social media engagement

Public health communication suggests a two-way communication. To comprehensively assess the health communication on Weibo, the messages should also be examined in terms of engagement. According to Baym (2013), when conducting quantitative research on social media, the number of clicks, likes, comments, retweets and followers can be used to measure engagement. The analysis of social media engagement is based on Liu et al. (2016)'s previous research that introduced a framework of virality on social media in terms of authority, privacy, evidence and incentive appeals.

***Table 6**: Social media engagement result*

	Avg. retweets per post	**Avg. comments per post**	**Avg. likes per post**
Place crisis into a framework	2420	1697	2900
Comprehend the situation	1650	3075	4892
Vaccine/treatment development	4445	4861	10256
Refute the rumour	2569	1721	2346
Disease control instruction	3030	3028	5834
Travel advice	1739	3450	6745
Daily life advice	2951	2528	4184

5.4.1 Authority and cognitive demand

The trustworthiness or authority of a post, and the cognitive resources of different behaviours such as liking or sharing, both shape engagement on social media. Since there can be some interactions between these two concepts, they will be discussed in parallel in this section.

It has been suggested that different types of engagement with social media require different extents of cognitive resources (Alhabash & McAlister, 2015; Liu et al., 2016), where cognitive resources refers to the idea than an individual needs "a certain cognitive capacity to carry out various tasks, for instance, respond to challenges and problems by actively encoding, processing, and recalling needed information" (Goldstein, 2011, p.87; APA Dictionary). According to this, the less cognitive resources are required for an action, the more frequent it will happen. The influence of authority is more difficult to grasp and can have various effects. As an example, it can influence the cognitive resources required for engagement: It was suggested that bandwagon (people tend to follow the opinions that many other people like) in particular can cause this, since people merely need to copy the behaviour of others (Sundar, 2008).

The results presented in this work show that posts consistently get more likes than retweets. In the context of cognitive resources and authority, this result suggests that in our case, the cognitive resources for liking are the lowest among the engagement behaviours, contradicting earlier studies that found retweeting to be the least demanding action (Alhabash & McAlister, 2015; Liu et al., 2016). This in turn could mean that the bandwagon effect applies more strongly to liking, breaking down the psychological barrier for this type of behaviour in particular.

The highest numbers of likes, retweets and comments were all achieved in the same category, vaccine/treatment development. When looking at posts from this category, several trends can be noticed. First, there are a number of ambiguous messages as explained in the section about intelligibility. Second, there is a high proportion of messages with professional authority, i.e. the posts seem more trustworthy because of either citing professional sources, or because of affiliation to professional institutions. These two trends likely work together to achieve the high engagement number. On the one hand, unclear messages frequently cause heated discussions, which can increase the numbers of comments and retweets. On the other hand, the high amount of authority makes it more likely for people to like these posts.

5.4.2 Privacy end evidence

Literature suggests that in health communication, there are two kinds of evidence: statistical evidence, which reflects general trends without referring to any one experience, and narrative evidence, which is based on a personal narrative (Liu et al., 2016). It has been stated that the development of social media has blurred the lines between public and private spheres (Papacharissi, 2010). I collected the five posts with the most likes (in the last part I discussed that liking is more representative for popularity) from each category and examined them in terms of the types of evidence. Out of the 35 analyzed messages, only two were based on private experiences. These two posts are shown below:

> ***Communist Youth League Central Committee:*** *It is a rumour that "A baby infected with coronavirus asked the doctor for a hug during her quarantine". Some people interpreted it as*

"the baby was isolated because of the coronavirus". The baby's father disproved it; his child has leukaemia instead of COVID-19, he hopes the media can help him refute the rumour." (Retweet 431 Comment 400 Like 5166)

***People's Daily**: "A Wuhan University student got infected and quarantined himself for 38 days. As a result, he didn't infect anyone else. After cured, he donated his blood plasma for healing more people." Guo Yue, a student at Wuhan University, was diagnosed with COVID-19 after returning to his hometown from Wuhan. He did his best to protect other people from being infected by him: he wore a mask on his way home, and after he arrived home, he isolated himself in his room for 38 days. (Retweet 10057 Comment 28307 Like 1043100)*

The messages which can be considered as statistical evidence often contain statistical data such as the number of the cases and death. Here are two examples of statistical evidence:

***People's Daily**: 444 new cases have been confirmed, there are in total of 1287 COVID-19 cases reported. (Retweet 16232 Comment 75002 Like 1842984)*

***CCTV News**: Zhou Xianwang, the mayor of Wuhan: nearly 5 million people have left the city because of the Spring Festival and the outbreak. (Retweet 56172 Comment 117344 Like 2581096)*

The observation that private messages seem to be less popular brings up the question of whether my method of picking the posts (according to likes) might have made it less likely for such messages to appear in the sample, resulting in an inaccurate representation of the posts in general. Therefore, more posts were picked at random. However, the number of private messages remained low. This allows to make a second statement about the private messages: The organizations did not involve much private information in their messages. This provides empirical support to Chew and Eysenbach (2010) 's argument that public news is more frequently posted than private experiences.

It remains disputed whether statistical evidence or narrative evidence has more persuasive power. This study is not able to answer this question either. All of the example posts shown

above received much more comments than retweets. It suggests that the public expect to have a conversation with the organization rather than share it to others.

Another facet of privacy is experienced by the users as they engage with content. Different engagement actions are thought to have different degrees of privacy. Retweeting is one-to-many communication as it presents the messages to other people on Weibo, while liking and replying are more of one-to-one communication which protect privacy more (Liu et al., 2016). While both retweeting and liking can show approval, liking is considered a more private form of approval. As I discussed before, the public was in general more likely to like posts. This could mean that there is a connection between the privacy of an action and the cognitive demand of that action. Arguably, the less private an action, the higher the cognitive demand. There is also an indication that people not only consider their own privacy, but also that of others: For the two specific messages that related to private experience, the number of likes was more than ten times the number of retweets, indicating a stronger role of one-to-one communication in the news containing personal experience. In other words, private approval is more frequently found than public approval in private messages.

If the above assumptions are true, sharing a post demands the most effort. However, sharing is essential for disseminating information. It would be important to understand which messages are most likely to be shared. The average retweets of disease control instruction and daily life advice ranked second and third, respectively, among the efficiency message subcategories. The messages that help to comprehend the situation came last. It showed that people on Weibo were more likely to spread efficacy messages to others. Besides, as I discussed, health communication is supposed to encourage public engagement to maximize efficiency. Looking into the content of these messages, a considerable amount of these messages encouraged users to share, for example:

> ***People's Daily****: How to protect yourself in the outbreak? Go out less frequently, meet friends and family less frequently, wash your hands more frequently and frequently ventilate your room...We are working together against the virus! Retweet this to your family and friends. (Retweet 32282 Comment 1858 Like 18259)*

> ***Ziguang Pavilion**: "Please retweet and save this! The correct way of putting on the mask" This video will tell you how to distinguish the sides of the mask and how to confirm the tightness of the mask. (Retweet 1196 Comment 420 Like 465)*

Messages which encouraged people to share them had much more retweets than likes. It showed that attempts by the organizations to encourage one-to-many communication of efficacy messages worked well.

5.4.3 Incentive appeal

Incentive appeal contains positive appeal and negative appeal. According to Liu et al. (2016), positive appeal highlights the positive outcomes of the recommended behaviours, while negative appeal pays more attention to the negative outcomes of the threat. We can't directly recognize the positive appeal and negative appeal from the results. However, upon closer inspection of some of the posts, it seems like most efficacy messages (disease control instruction, daily life advice and travel advice) work with positive appeal since they were persuading people to behave in the correct way during the outbreak. The messages about comprehending the situation and associating the current crisis with an old crisis were more likely to warn people by illustrating the terrible current situation and likely outcomes of the crisis.

According to the results, the messages that received most likes, and those that were shared most, both belong to the efficacy messages which were just identified as working with positive incentives. On the other hand, the messages with least retweets, comprehend the situation, and the messages with the least comments and likes, place crisis into a framework, where the two categories identified as working with negative incentives. This shows that in terms of the amount of engagement behaviour, the audience was more likely to engage with the positive appeals which looked more optimistic in the outbreak, while negative appeals which have delivered more threat to the audience caused less close engagement. This also empirically supports O'Keefe & Jensen (2008)'s argument that positive appeals attract more message engagement than negative appeals.

6. Conclusion and outlook

6.1 Conclusion

This study examined the health crisis communication during the Covid-19 outbreak on Weibo, which is led by the state-owned media, in terms of the quality of health messages and message engagement. The four important state-owned media that were chosen to be my message resources are **People's Daily, CCTV News**, **Communist Youth League Central Committee** and **Ziguang Pavilion**. The concepts of crisis communication, risk communication and social media engagement were used to help understand the basis of my research. To examine the strategy of communication and the quality of the messages, I have used the CERC framework to categorize the messages and further analyze their effectiveness. I primarily considered Weick's and Bandura's work to elaborate the process of sensemaking and self-efficacy suggested by the CERC framework. To explore the social media engagement with these messages, I have used Liu et al. (2016)'s theory of virality on social media which is elaborated from four aspects: authority, privacy, evidence and incentive appeal. I have used the theory of authority and cognitive resources to explain the frequency of engagement behaviours (liking, retweeting and commenting). Privacy and evidence are harnessed to elaborate on the use of one-to-one communication and one-to-many communication in health crisis communication. I have used the concept of incentive appeal to understand the effect of positive messages and negative messages.

My research enabled me to answer **RQ1-** *in the coronavirus crisis, what roles do the state-owned media play in health crisis communication in terms of the messages they delivered on Weibo* and *how is the quality of the messages*, and **RQ2** - *how is the public engaged with the health messages on Weibo*. The analysis I have conducted has given the following results to answer **RQ1:**

The four state (government) - owned organizations have utilized Weibo as a platform to deliver a large number of sensemaking messages and efficacy messages in a health crisis. Among all the messages related to coronavirus, health messages (sensemaking messages and efficacy messages) were more frequently found in the two state-owned news accounts' posts

than the two government affairs accounts' posts, however, even for the former, the percentage of health messages was less than 70%. Therefore, more than 30% of the coronavirus-related messages either didn't help the public make meaning of the coronavirus outbreak or guide people behave correctly. It indicates that the organizations played a crucial role in delivering sensemaking messages and efficacy messages in the health crisis but they did not fully function as a health communicator who strictly follows the health communication framework.

The results also showed us that the media were more likely to post sensemaking messages than efficacy messages. The percentage of efficacy messages were less than 30% in all four accounts' messages. However, social media engagement results indicated that the public was more likely to engage with efficacy messages. The more people are engaged with a message, the more time they spend thinking about it, which in turn helps them to memorize the content. Considering this, we can argue that efficacy messages are more effective than sensemaking messages simply because they are more present in the people's minds. The accounts that did not use a lot of efficacy messages should consider using them more in order to strengthen their health communication.

The qualitative analysis also allowed for a rough assessment of the quality of the messages. It revealed a detailed description of the content, as well as the accuracy, intelligibility and relevance of the messages. I learned that generally, the messages contain useful information. However, I also discussed some problems I found. The inaccurate statistical data might not be able to assist the public to make sense of what is going on and assess the situation appropriately. The confusing word used in the medicine-related message can cause inappropriate behaviours, such as buying medicine that people do not need to take. Some messages that are not highly related to the virus and disease were also found, particularly among the refuse the rumour messages. Those messages are not as helpful as the ones who interpret the disease and instruct appropriate behaviours. However, they built the government's reputation so that people were more likely to trust the government and follow the instructions. Besides, the communication strategy " familiarity breeds trust" was found often used in persuading the public to follow the instructions and advice.

Social media has both positive and negative effect on the message communication. On the one hand, it increases communication efficiency by providing instantaneous multimedia content to the audience and building interactive relations with them. The feedback allows the organization to quickly correct the messages and update further information according to the public's reaction. On the other hand, the rapid spreading on social media magnified every piece of flawed messages, thus leading to unexpected consequences more easily. Therefore, it requires the message senders to consider more carefully before sending messages to the public.

The results concerned with **RQ2** are as follows:

According to the engagement data, the public is engaged with the messages on Weibo in terms of the engagement behaviour. I identified five nodal points to elaborate on the results. (1) The bandwagon effect is more likely to cause likings, and liking requires the least cognitive resources. (2) The popularity of vaccine/treatment development indicates that bandwagon and professional authority work together to achieve especially high engagement numbers. (3) The organizations tend to involve less personal experience in their posts and the participants are more likely to show a more private acknowledgement to the content containing personal experience. (4) One-to-one communication (like and reply) is, in general, more frequently found, while one-to-many communication (retweet) work out better with the organization's encouragement. Efficacy messages often contained such encouragement. (5) Appeals showcasing the positive outcomes of recommended behaviours are more likely to obtain public engagement. Messages highlighting the dangers of the current situation get fewer retweets, comments and likes.

6.2 Limitations

I aimed to discover the health crisis communication on Weibo, from an objective perspective. Therefore, I used content analysis as my main method and it enabled me to reach my research goal also. However, it is important to be aware of the limitations of my study. I have limited the message resources into four state official accounts. There are still some other influential

state-owned media accounts on Weibo, their way of communicating in a health crisis might differ. The analysis of messages was based on CERC framework in my research, CERC framework is a general health crisis communication theory framework, I am sure that there would be some other theories that can provide another perspective of understanding the social media messages. In the analysis, I found some messages with the ambiguous word; for example, a message delivers wrong information to the public by telling them one medicine can inhibit the virus. "Inhibit" here is not clear, which leads people to misunderstand that medicine can prevent healthy people from getting infected. The bulk-buying of the medicine makes people who need this medicine cannot buy it timely. However, the discussion of the certain ambiguous messages was more combined with the empirical fact, I suggest the further research could go deeper into examining the ambiguous messages in health communication using more theories. Also, my research still stayed at the level of harnessing the theory of health communication and social media engagement for practical cases, it didn't develop the theory or generate an applicable concept for future studies. Besides, I am aware that the methods for research like this can be more diverse, for example, an in-depth interview would give us a deeper look at the ideas of the participants. For social media engagement, I chose to measure the engagement from the number of likes, retweets and comments, as suggested by Baym (2013), and I looked at the data from the virality theory. I suggest the further research could explore the message engagement in terms of the usage of emoticons. Emoticons have always been considered as cues to stress emotional intentions. The emoticons-related research will contribute to a more accurate understanding of the engagers' emotions.

6.3 The generalization of the research

The research is based on Chinese social media - Weibo. The findings contribute to the health crisis communication on Weibo, which is dominated by state institutions. Nevertheless, according to Smith (1975), "the goal of science is to be able to generalize findings to diverse populations and times" (p.88). Thus it is also crucial to relate the research more broadly to a bigger picture. As for the platform, Weibo is a representative in microblogging services which shares most of the functionalities with Twitter. Therefore, the methodology used in this work can be used for other social platforms, specifically Twitter, just as my own methodology was also inspired by research on Twitter. The generalizability of results should

be more carefully considered: Human behaviour is strongly influenced by culture; therefore, care has to be taken when transferring the results to other cultural spheres. Also, on Weibo, communication is dominated by state institutions, the involvement of other public organizations, especially non-profit organizations, is very low. The situation in the West might differ. However, the examination of the messages is based on the CERC framework, which is a universal theory for health crisis communication and promoted by the U.S. CDC. While only state-owned accounts have been analyzed, the comparison of news agencies and government affairs accounts gives hints about how different organisations can follow different health communication strategies. Also, Covid-19 is a representative choice of a health crisis; as tragically demonstrated in the past months, it can affect countries all across the world. Last but not least, even though the answers to the research questions might differ between different countries/organizations, the questions themselves are universally relevant in today's highly digitalized world.

7. Bibliography

A report on online rumor governance in 2018 in China. (2019). SYSU and Tencent. Retrieved from http://society.people.com.cn/n1/2019/0118/c1008-30574893.html

Abbasi, M. A., & Liu, H. (2013). Measuring user credibility in social media. In Lecture Notes in Computer Science. (Vol. 7812 LNCS), pp. 441–448. Retrieved from https://doi.org/10.1007/978-3- 642-37210-0_48

Adams, S. A. (2010). Revisiting the online health information reliability debate in the wake of "web 2.0": An interdisciplinary literature and website review. International Journal of Medical Informatics, 79, 391– 400.

Adibi, Sasan. (2015). Mobile Health A Technology Road Map. Springer Cham Heidelberg New York Dordrecht London.

Ahn, S. J., & Bailenson, J. N. (2011). Self-endorsing versus other-endorsing in virtual environments: The effect on brand attitude and purchase intention. Journal of Advertising, 40(2), 93–106.

Alhabash, S., & McAlister, A. R. (2015). Redefining virality in less broad strokes: Predicting viral behavioral intentions from motivations and uses of Facebook and Twitter. New Media & Society, 17, 1317–1339.

Allen, M. (2017). Statistical Evidence in Health and Risk Messaging. Oxford Research Encyclopedias. Health and Risk Communication

Allmer, T. (2014). Social Media as Surveillance: Rethinking Visibility in a Converging World, Ashgate: Farnham and Burlington. European Journal of Communication, 29(3), 376–379.

American Psychological Association (APA) Dictionary, Cognitive resource theory, https://dictionary.apa.org/cognitive-resource-theory

Appelbaum, A. (2001). The Constant Consumer. Business Journal. June 17. Retrieved from https://news.gallup.com/businessjournal/745/constant-customer.aspx

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, N.J.: Prentice-Hall.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), Encyclopedia of human behavior (Vol. 4, pp. 71-81). New York: Academic Press.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. Psychological Review, 84, 191-215.

Bandura, A. (1993) Social cognitive theory and exercise of control of HIV infection. In Peterson, J. and Di Clemente, R (Ed.), Preventing AIDS: Theory and Practice of Behavioral Interventions. Plenum Press, New York.

Barbalet, J. M.(1998). Emotion, social theory, and social structure: A macro sociological approach. Cambridge, UK: Cambridge University Press.

BBC NEWS. (2020), Li Wenliang: Coronavirus death of Wuhan doctor sparks anger. Retrieved from https://www.bbc.com/news/world-asia-china-51409801

Belz, Frank-Martin and Wenke Baumbach. (2010). "Netnography as A Method of Lead User Identification". Creativity and Innovation Management 19 (3): 304-313. Accessed January 15, 2016.

Bennett, W. L., Wells, C., & Freelon, D. (2011). Communicating civic engagement: Contrasting models of citizenship in the youth websphere. Journal of Communication, 61, 835–856.

Bernhardt, M. J. (2004). Communication at the Core of Effective Public Health. American Journal Public Health. 2004 December; 94(12): 2051–2053. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1448586/

Bhat, A. (n.d.). Qualitative research: definition, types, methods and examples. QuestionPro. Retrieved from https://www.questionpro.com/blog/qualitative-research-methods/

Boblin et al., (2013). Using Stake's Qualitative Case Study Approach to Explore Implementation of Evidence-Based Practice. Qualitative Health Research XX(X) 1 –9. Sage

Bonabeau, E. (2004). The perils of the imitation age. Harvard Business Review, 82(6), 45–54.

Boulos Kamel N. Maged. (2013). Social media and mobile health. Health Literacy. World Health Organization

Boyd, D., Golder, S., & Lotan, D. (2010). Tweet, tweet, retweet: Conversational aspects of retweeting on Twitter. Kauai, HI: IEEE.

Brodie, R. J., Hollebeek, L., Juric, B., & Ilic, A. (2011). Customer engagement: Conceptual domain, fundamental propositions, and implications for research. Journal of Service Research, 14, 252–271

Calder, B. J., Malthouse, E. C., & Schaedel, U. (2009). An experimental study of the relationship between online engagement and advertising effectiveness. Journal of Interactive Marketing, 23(4), 321–331.

Campbell, C., Pitt, L. F., Parent, M., & Berthon, P. R. (2011). Understanding consumer conversations around ads in a web 2.0 world. Journal of Advertising, 40(1), 87–102.

Castells, M. (1996). The rise of the network society. Malden, MA: Blackwell.

Chai, R.T. (1978). A content analysis of the obituary notices on Mao Tse-Tung, Public Opinion quarterly.41:475-487.

Chan, Rosalie. 2020. Transit going in and out of Wuhan, China is being shut down to contain coronavirus. Business Insider. https://www.businessinsider.de/international/transit-wuhan-china-shut-down-coronavirus-2020-1/?r=US&IR=T

Chew, C., & Eysenbach, G. (2010). Pandemics in the age of Twitter: Content analysis of tweets during the 2009 H1N1 outbreak. PLoS ONE, 5(11), e14118 (14111–14113).

ChinaZ. (2019). 微博活跃用户达4.3亿，16到25岁人群占比61% (The Population of Weibo Users Has Reached 430 Billion). Retrieved from: http://www.chinaz.com/news/2019/0130/988669.shtml

Chou, W. Y. S., Hunt, Y. M., Beckjord, E. B., Moser, R. P., & Hesse, B. W. (2009). Social media use in the United States: Implications for health communication. Journal of Medical Internet Research, 11(4), e48.

Cohn Michael. (2011). Social Media vs Social Networking. Compukol Communications LLC. Retrieved from: https://www.compukol.com/social-media-vs-social-networking/

Communist Youth League of China. n.d. In Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Communist_Youth_League_of_China#cite_note-FOOTNOTERistaino1988420-2

Coombs T. W. (2015). Ongoing crisis communication: Planning, Managing, and Responding. University of Central Florida.—Fourth edition.

Criscione Teodoro. (2019). Comparison of Information Spreading on Sina Weibo and Twitter Network. Central European University. Retrieved from https://networkdatascience.ceu.edu/article/2019-04-01/comparison-information-spreading-sina-weibo-and-twitter-network

Cui Minxi. (2014). 新浪微博健康传播研究 (The research on health communication on Weibo). Hunan University. Retrieved from: http://www.wanfangdata.com.cn/details/detail.do?_type=degree&id=Y2605554#

Dellarocas, Chrysanthos (2003), "The Digitization of Word-of-Mouth: Promise and Challenges of Online Feedback Mechanisms," Management Science, 49, 10, 1407–24.

Devi Prasad, B & Sampath Kumar, R D (1991) Opinion moulding by the press: An analysis of the election related content of editorials and letters to the editors, Media Asia, 18 (1): 24-29.

Dolan, M. R. (2015). Social media engagement behavior: a uses and gratifications perspective. University of Adelaide.

Drabek, T. E., (1999). Understanding disaster warning responses. Soc. Sci. J., 36, 515–523,

Endsley MR. (1995). Toward a theory of situation awareness in dynamic systems. Human Factors : 1995:37(1):32–64.

Flin R, O'Connor P, Crichton M. (2008). Safety at the Sharp End: A Guide to Non-Technical Skills. Boca Raton, FL: CRC Press.

Flyvbjerg, Bent. (2006). "Five Misunderstandings About Case-Study Research". Qualitative Inquiry 12 (2): 219-245.

Forbes. (2018). How Social Media Has Changed How We Consume News. Retrieved from: https://www.forbes.com/sites/nicolemartin1/2018/11/30/how-social-media-has-changed-how-we-consume-news/#339fd00f3c3c

Freimuth. V., Linnan, H. W., & Potter, P. (2000). Communicating the threat of emerging infections to the public. Emerging Infectious Diseases, 6, 4. Retrieved from: http:www.cdc.govncidodeidvol6no4freimuth.htm

Fritch, J.W.,&Cromwell, R. L. (2001). Evaluating Internet resources: Identity, affiliation, and cognitive authority in a networked world. Journal of the American Society for Information Science and Technology, 52, 499–507.

Funk, T. (2011). Social media playbook for business. Santa Barbara, CA: Praeger.

Gallant, L. M., Irizarry, C., Boone, G., & Kreps, G. L. (2011). Promoting participatory medicine with social media: New media applications on hospital websites that enhance health education and e-patients' voices. Journal of Participatory Medicine, 3. Retrieved from: http://www.jopm.org/evidence/research/2011/10/31/promotingparticipatory-medicine-with-social-media-new-media-applicationson-hospital-websites-that-enhance-health-education-and-e-patientsvoices

Gao Q., Abel F., Houben GJ., Yu Y. (2012) A Comparative Study of Users' Microblogging Behavior on Sina Weibo and Twitter. In: Masthoff J., Mobasher B., Desmarais M.C.,

Nkambou R. (eds) User Modeling, Adaptation, and Personalization. UMAP 2012. Lecture Notes in Computer Science, vol 7379. Springer, Berlin, Heidelberg.

Gentles et,al.(2015). Sampling in Qualitative Research: Insights from an Overview of the Methods Literature. The Qualitative Report 2015 Volume 20, Number 11, Article 4, 1772-1789.

Geurten, M., S. Willems, S. Germain, and T. Meulemans. (2015). Less is more: The availability heuristic in early childhood. *Br. J. Dev. Psychol.*, **33**, 405–410

Gioia, D. A., J. B. Thomas, S. M. Clark, K. Chittipeddi. (1994). Symbolism and strategic change in academia: The dynamics of sensemaking and influence. Organ. Sci. 5 363–383.

Goldstein, E. B. (2011). Introduction to cognitive psychology. In *Cognitive psychology: Connecting mind, research, and everyday experience*. Australia: Wadsworth Cengage Learning.

Gorrell, G., & Bontcheva, K. (2014). Classifying Twitter favorites: Like, bookmark, or thanks? Journal of the Association for Information Science and Technology.

Guidry, P.D. Jeanine, et al. (2017). Ebola on Instagram and Twitter: How health organizations address the health crisis in their social media engagement. Public Relations Review. Volume 43, Issue 3, Pages 477-486.

Gummerus, J., Liljander, V., Weman, E., & Pihlström, M. (2012). Customer engagement in a Facebook brand community. Management Research Review, 35, 857–877.

Gurman A. Tilly, Rubin E. Sara and Roess A. Amira. 2012. Effectiveness of mHealth Behavior Change Communication Interventions in Developing Countries: A Systematic Review of the Literature. Journal of Health Communication, 17:82–104

Hancké, Bob. 2009. Intelligent Research Design. Oxford: Oxford University Press.

Hansen, D. L., B. Shneiderman, and M. A. Smith. (2011). Analyzing social media with NodeXL: Insights from a connected world. Burlington, MA: Elsevier.

Hansen, L., Arvidsson, A., Nielsen, F., Colleoni, E., & Etter, M. (2011). Good friends, bad news-affect and virality in Twitter. In J. J. Park, L. T. Yang, &C. Lee (Eds.), Future information technology. Berlin, Germany: Springer.

Hargittai, E., & Hsieh, Y.-L. P. (2010). Predictors and consequences of differentiated practices on social network sites. Information, Communication, & Society, 13(4), 515–536.

Heldman, A. B., Schindelar, J., & Weaver, J. B., III. (2013). Social media engagement and public health communication: Implications for public health organizations being truly ‘‘social.’’ Public Health Reviews, 35(1). Retrieved from http://www.publichealthreviews.eu/upload/pdf_files/13/00_Heldman.pdf

Hertwig, R., T. Pachur, and S. Kurzenhäuser, 2005: Judgments of risk frequencies: Tests of possible cognitive mechanisms. *J. Exp. Psychol.*, **31**, 621–642.

Hollebeek, L. D., Glynn, M. S., & Brodie, R. J. (2014). Consumer brand engagement in social media: Conceptualization, scale, and validation. Journal of Interactive Marketing, 28, 149–165.

Johnston, K. A. (2014). Public relations and engagement: Theoretical imperatives of a multi-dimensional concept. Journal of Public Relations Research, 26, 381–383.

Jozani, M., et al. (2020). Privacy concerns and benefits of engagement with social media-enabled apps: A privacy calculus perspective. Computers in Human Behavior Volume 107, June 2020, 106260.

Kahn G. James, Yang S. Joshua and Kahn S. James. 2010. ‘Mobile’ Health Needs And Opportunities In Developing Countries. Health Affairs 29, NO. 2: 254–261

Kang, M. (2014). Understanding Public Engagement: Conceptualizing and Measuring its Influence on Supportive Behavioral Intentions. Journal of Public Relations Research. Volume 26 Issue 5.

Khanna, A., 2015. Venmo’ed: Sharing your payment data with the world. Technology Science 2015102901.

Kuo William. (2018). Top 10 Wemedia Marketing Platforms In China Ⅰ. Medium. Retrieved from:https://medium.com/@williamkuo1988/top-10-wemedia-marketing-platforms-in-china-%E2%85%B0-c7a26358b3a0

Lash, S. (2002). Critique of information. London, UK: Sage.

Lee Ji Young & Sundar Shyam S. (2012). To Tweet or to Retweet? That Is the Question for Health Professionals on Twitter. Health Communication Volume 28, 2013 - Issue 5. Retrieved from: https://doi.org/10.1080/10410236.2012.700391

Li, C., & Bernoff, J. (2011).Groundswell: Winning in a world transformed by social technologies. Boston, MA: Harvard Business Review.

Li Wenliang. (2020). In Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Li_Wenliang

Li Ya. (2012). 从政务微博看政府信息公开的发展 The development of government information disclosure from the perspective of government affairs Weibo. E-government.

Liu Xinchuan, Lu Jia and Wang Haiyan. (2016). When Health Information Meets Social Media: Exploring Virality on Sina Weibo. Health Communication. Routledge Taylor & Francis Group.

Liu, F., Burton-jones, A., & Xu, D. (2014). Rumors on social media in disasters: Extending transmission to retransmission. In Proceedings of the Pacific Asia Conference on Information Systems (PACIS).

Lomborg Stine and Bechmann Anja. (2014). Using APIs for Data Collection on Social Media. The Information Society, 30: 256–265. Routledge.

Lovejoy, K., Waters, R. D., & Saxton, G. D. 2012. Engaging stakeholders through Twitter: How nonprofit organizations are getting more out of 140 characters or less. Public Relations Review, 38(2), 313–318.

Loy, Pamela. (1979). Content analysis of Journal articles as a technique for historical research, Journal of the History of Sociology, 1,2: 93-101.

McCay-Peet Lori and Quan-Haase Anabel. (2016). A Model of Social Media Engagement: User Profiles, Gratifications, and Experiences. Springer International Publishing Switzerland.

Maibach, E. and Murphy, A.D. (1995). Self-efficacy in health promotion research and practice: conceptualization and measurement. Health Education Research. Vo1.10. no.l. Pages 37-50

May, S., & Mumby, D. K. (2005). Engaging organizational communication theory & research: Multiple perspectives. Thousand Oaks, CA: Sage.

Mayhorn, C. B., and A. C. McLaughlin. (2014): Warning the world of extreme events: A global perspective on risk communication for natural and technological disaster. *Saf. Sci.*, **61**, 43–50.

Media In The Future. n.d. We Media - Introduction. Retrieved from: https://lianl579.github.io/projects/media/2.html

Meier, F., Elsweiler, D., & Wilson, M. L. (2014). More than liking and bookmarking? Towards understanding Twitter favoriting behavior. Published in ICWSM. Computer Science

Metaxas, P., Mustafaraj, E., Wong, K., Zeng, L., O'Keefe, M., & Finn, S. (2014). Do retweets indicate interest, trust, agreement? Computation and Journalism Symposium, New York, NY.

Milbrath, S. (2012). Social media management during Hurricane Sandy. Retrieved from: http://blog.hootsuite.com/ hurricane-sandy-social-media

Mileti, D. S. & Sorensen, J. H. (1990). Communication of emergency public warnings. Washington, DC: Federal Emergency Management Administration.

Mileti, D. S., and L. Peek. (2000): The social psychology of public response to warnings of nuclear power plant accident. *J. Hazard. Mater.*, **75**, 181–194.

Mosteller Jill and Poddar Amit. (2017). To Share and Protect: Using Regulatory Focus Theory to Examine the Privacy Paradox of Consumers' Social Media Engagement and Online Privacy Protection Behaviors. Journal of Interactive Marketing 39 (2017) 27–38.

Murray-Johnson, L., Witte, K., Liu, W., & Hubbel, A. P. (2001). Addressing cultural orientations in fear appeals: Promoting AIDS-protective behaviors among Mexican immigrant and African American adolescents and American and Taiwanese college students. Journal of Health Communication, 6, 335–358.

Nichols, S. L., Friedland, L. A., Rojas, H., Chos, J., & Shah, D. V. (2006). Examining the effects of public journalism on civil society from 1994 to 2002: Organizational factors, project features, story frames, and citizen engagement. Journalism & Mass Communication Quarterly, 83(1), 77–100.

O'Keefe, D., & Jensen, J. D. (2008). Do loss-framed persuasive messages engender greater message processing than do gain-framed messages? A meta-analytic review. Communication Studies, 59, 51 –67.

Oh, J., Bellur, S., & Sundar, S.S. (2010). A conceptual model of user engagement with media. Paper presented to the mass communication division at the 60th annual conference of the International Communication Association, Singapore.

Paek, H.-J., Hove, T., Jung, Y., & Cole, R. T. (2013). Engagement across three social media platforms: An exploratory study of a cause-related PR campaign. Public Relations Review, 39, 526–533.

Papacharissi, Z. (2010). A private sphere: Democracy in a digital age. Cambridge, MA: Polity.

Park, Hyojung, Reber, H.Bryan & Chon, Myong-Gi. (2015). Tweeting as Health Communication: Health Organizations' Use of Twitter for Health Promotion and Public Engagement. Journal of Health Communication, 0:1–11. Taylor & Francis Group, LLC.

Phillips, D. (2008). The psychology of social media. Journal of New Communication Research, 3(1), 79–85.

Prasad. D. B. (2008). Content Analysis: A method in Social Science Research. From: Lal Das, D.K and Bhaskaran, V (eds.). Research methods for Social Work, New Delhi:Rawat, pp.173-193.

Rains, S. A., & Keating, D. M. (2011). The social dimension of blogging about health: Health blogging, social support, and well-being. Communication Monographs, 78(4), 511–534.

Recuero, R., Araújo, R. M., & Zago, G. (2011). How does social capital affect retweets? Proceedings of Fifth International AAAI Conference on Weblogs and Social Media (ICWSM), Barcelona. Palo Alto, CA: AAAI Press.

Reinard,J.C.(1988).The Empirical Study Of The Persuasive Effects Of Evidence: The status after fifty years of research. Human Communication Research, 15,3–59.

Reuter, C., Heger, O., & Pipek, V. (2013). Combining real and virtual volunteers through social media. Iscram, 2013(May), 780–790. Retrieved from https://doi.org/10.1126/science.1060143

Relman, Eliza. (2020). China confirmed that the deadly Wuhan virus sweeping the country can spread from human to human, increasing the risk of an epidemic. Business Insider. Retrieved from https://www.businessinsider.de/international/deadly-china-wuhan-virus-spreading-human-to-human-officials-confirm-2020-1/?r=US&IR=T

Reynolds, B. (2006). Crisis and Emergency Risk Communication: Pandemic influenza. Atlanta, GA: Centers for Disease Control and Prevention.

Reynolds, B. and Seeger W.,M. (2005). Crisis and Emergency Risk Communication as an Integrative Model. Journal of Health Communication, 10:43–55. Routledge.

Reynolds, B., & Quinn, S. C. (2008). Effective communication during an influenza pandemic: The value of using a crisis and emergency risk communication framework. Health Promotion Practice, 9(4 Suppl.), 13S–17S.

Reynolds, R. A., & Reynolds, J. L. (2002). Evidence. In J. E. Dillard & M. Pfau (Eds.), The persuasion handbook: Developments in theory and practice (pp. 513–542). Thousand Oaks, CA: Sage.

Ropeik, D. & Gray, G. (2002). Risk: A practical guide for deciding what's really safe and what's really dangerous in the world around you. Boston, MA: Houghton-Mifflin.

Sandman, P. (2002). Smallpox vaccination: Some risk communication linchpins. Retrieved from: http:www.psandman.com.col.SARS-1.htm

Sandman, P. M. (1993). Responding to community outrage: Strategies for effective risk communication. Fairfax, VA: American Industrial Hygiene Association.

Saxton, G. D., & Waters, R. D. (2014). What do stakeholders like on Facebook? Examining public reactions to nonprofit organizations' informational, promotional, and community-building messages. Journal of Public Relations Research, 26(3), 280–299

Scholer, A.A.,& Higgins,E.T. (2009). Exploring the complexities of value creation: The role of engagement strength. Journal of Consumer Psychology, 19(2), 137-143

Schwarzer, R. and Fuchs, R. (1995). Self-Efficacy and Health Behaviours. Predicting Health Behaviour: Research and Practice with Social Cognition Models. Buckingham: Open University Press.

Seeger, M. W., T. L. Sellnow, and R. R. Ulmer. (1998): Communication, organization and crisis. *Commun. Yearb.*, **21**, 231–275.

Smith G. B.& Galiicano D. T. (2015). Terms of engagement: Analyzing public engagement with organizations through social media. Computers in Human Behavior 53 (2015) 82–90

Smith, B. G. (2010). Socially distributing public relations: Twitter, Haiti, and interactivity in social media. Public Relations Review, 36(4), 329–335

Smith, B.G.,& Gallicano, D.T. (2015). Terms of engagement: Analyzing public engagement with organizations through social media. Computers in Human Behaviours 53. 82-90

Smith, H.W. (1975). Strategies of Social Research: The Methodological Imagination. Englewood Cliffs, NJ: Prentice-Hall.

Sorensen, J. H. (2000). Hazard warning systems: Review of 20 years of progress. Natural Hazards Review, 1(2), 119–125.

Stake, R. E. (2005). Qualitative case studies. In Y. S. Lincoln & N. K. Denzin (Eds.), The handbook of qualitative research. Thousand Oaks, CA: Sage.

Statista. (2020). Coronavirus (COVID-19) information sources among the German population in 2020.

Stieglitz S, Bunker D, Mirbabaie M, Ehnis C. (2018). Sense-making in social media during extreme events. J Contingencies and Crisis Management.

StoryMaps. (2020). Mapping the Wuhan coronavirus outbreak. Retrieved from: https://storymaps.arcgis.com/stories/4fdc0d03d3a34aa485de1fb0d2650ee0

Sundar, S. S. (2008). The MAIN model: A heuristic approach to understanding technology effects on credibility. In M. J. Metzger & A. J. Flanagin (Eds.), Digital media, youth, and credibility. Cambridge, MA: MIT Press.

Sutton, J., and Woods, C. (2016). Tsunami Warning Message Interpretation and Sense Making: Focus Group Insights. AMS.

Taviss, I. (1969). Changes in the form of alienation: The 1900's vs. the 1950's. American Sociological Review, 34: 45-57.

Taylor, J. R., E. J. Van Every. (2000). The Emergent Organization: Communication as Its Site and Surface. Erlbaum, Mahwah, NJ.

Trottier, D., (2012). Social Media as Surveillance: Rethinking Visibility in a Converging World. Routledge. London and NewYork.

U.S. Centers for Disease Control and Prevention. (2003). Emergency risk communication CDCynergy (CD-ROM). Atlanta, GA: Author.

U.S. Centers for Disease Control and Prevention. (2007). Emergency preparedness and response. Retrieved December 19, 2007. Retrieved from: http://www.bt.cdc.gov/erc

U.S. Centers for Disease Control and Prevention. (1997). Principles of community engagement. Second Edition. CDC/ATSDR Committee on Community Engagement., Atlanta, GA.

U.S. Centers for Disease Control and Prevention. (2018). CERC Introduction. Atlanta. GA.

U.S. Centers for Disease Control and Prevention. (2018). The CDC Field Epidemiology Manual. Retrieved from https://www.cdc.gov/eis/field-epi-manual/index.html

U.S. Centres for Disease Control and Prevention. (2011). The Health Communicator's Social Media Toolkit.

U.S. Centres for Disease Control and Prevention. (2019). Health Literacy Basics. Retrieved from: https://www.cdc.gov/healthliteracy/learn/index.html

Van Heijnsbergen, C. C. R. J., Meeren, H. K. M., Grèzes, J., & de Gelder, B. (2007). Rapid detection of fear in body expressions, an ERP study. Brain Research, 1186, 233–241.

Vanderford, M. L., Nastoff, T., Telfer, J. L., Bonzo, S. E. (2007). Emergency communication challenges in response to Hurricane Katrina: Lessons from the Centers for Disease Control and Prevention. Journal of Applied Communication Research, 35, 9-25.

Veil Shari, Reynolds Barbara, Shellnow L. Timothy and Seeger W. Matthew. (2008). CERC as a Theoretical Framework for Research and Practice. Health Promotion Practice. October 2008 Vol. 9, No. 4, 26S-34S

Voit, L. (n.d.). Participation, openness, conversation, community, connectedness . . . yes that's what social media is all about! Retrieved from http://www.isnare.com/?aid=595202&ca=Marketing

Vos, C. Sarah and Buckner, M. Marjorie. (2016). Social Media Messages in an Emerging Health Crisis: Tweeting Bird Flu. Journal of Health Communication, 21:301–308. Routledge, Taylor & Francis Group, LLC.

We Are Social & Hootsuite. (2019). Digital 2019: Digital Year Book. https://wearesocial.com/global-digital-report-2019

Weick, K. E. (1988). Enacted sensemaking in crisis situations. Journal of Management Studies, 25, 305–317. doi: 10.1111= j.1467-6486.1988.tb00039.x

Weick, K. E. (1995). Sensemaking in organizations. Thousand Oaks, CA: Sage

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (2005). Organizing and the process of sensemaking. Organization Science, 16(4), 409–421.

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (2005). Organizing and the process of sensemaking. Organization Science, 16, 409–421.

Weick, Sutcliffe, and Obstfeld. (2005). Organizing and the Process of Sensemaking Organization Science 16(4), pp. 409–421.

Wise, K. (2001). Opportunities for public relations research in public health. Public Relations Review, 27, 475–487.

Witte, K., Meyer, G., & Martel, D. (2000). Effective health risk messages. Thousand Oaks, CA: Sage.

World Health Organization. (2020a). Naming the coronavirus disease (COVID-19) and the virus that causes it. Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it

World Health Organization. (2020b). Coronavirus. Retrieved from https://www.who.int/health-topics/coronavirus#tab=tab_1

World Health Organization. (2020c). "Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV)". Retrieved from https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-i

nternational-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)

World Health Organization. (2020d). "WHO Director-General's opening remarks at the media briefing on COVID-19". Retrieved from https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

Yu, G. (2011). Public opinion in the Chinese society: Annual report 2011. Beijing, China: People's Daily Press. Zhang, L. (2016). Reflexive expectations in EU–China relations: A media analysis approach. Journal of Common Market Studies, 54, 463–479.

Zeng et al. (2020). 新冠疫情：人们如何获取信息，2601份问卷调查数据告诉你. 传媒茶话会. (Coronavirus Outbreak: How people get information, the survey will tell you the results).

Zhang, Rui. (2020). 新冠肺炎之下，社交媒体的力量与风险 (The Power and Risk of Social Media Under Coronavirus). SocialTouch. Retrieved from: http://www.woshipm.com/it/3369541.html

Zhang, X., Tang, S., Zhao, Y., Wang, G., Zheng, H., Zhao, B.Y., 2017. Cold hard E-cash: Friends and vendors in the Venmo digital payments system, in: Eleventh International AAAI Conference on Web and Social Media.

Zoller, H. and Dutta, J. M. (2009). Emerging Perspectives in Health Communication: Meaning, Culture, and Power. Routledge.