International Journal of Media & Development Communication
Vol 2 | Issue 1 | June 2026 | 93-115

Social Media as a Platform for Risk and Science Communication: A Qualitative Analysis of Organizational Strategies in Pakistan

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Received: December 18, 2025; Accepted: March 24, 2026; Published: June 30, 2026

Abstract

The goal of the research is to investigate the methods of risk communication using social media and science. It is crucial to have a thoughtful discussion about fundamental scientific concepts and pertinent social issues, such as risk. The study examines the ways various types of organizations have utilized social media, identified prominent social media campaign patterns, and provided valuable lessons and practical recommendations for using social networking sites for risk communication. The study's focus is on communicating scientifically unsafe information as well as communicating scientifically risky information via social media. The research's objectives are to pinpoint strategies to enhance risk and science communication and to investigate the different ways that various organizations use social media for these purposes. The papers: (a) social media sites; (b) individuals; (c) critical communication, and (d) lessons gained are all thoroughly examined using the results. The qualitative technique is used in this study because it allows for a complete analysis of the issues surrounding science and risk communication, including the views of the participants and the state of risk communication in the scientific and other organizations they represent.

Keyword: Risk Communication, Science Communication, social media, Qualitative Research

1.Introduction

1.1 Background of the Study

The Science and Risk Communication (SRC) explores how individuals and societies construct communicate, uphold, and question ideas of science, technology, and risks in a variety of circumstances. Examples of certain circumstances may involve encounters between doctors and patients, awareness campaigns of that and participation in technological advancements or deterioration of the environment, and expert evidence at government policy proceedings.

Effective Science and Risk Communication equips individuals with the skills required to convey complex scientific and technological information to diverse audiences through multiple media channels. The learners can tailor the Science and Risk Communication concentration to their

Publisher: Department of Media and Development Communication, University of the Punjab, Lahore, Pakistan.

personal objectives by choosing from a wide selection of optional modules, which enables individuals to deepen their expertise in each field of study or their specific communication technical abilities.

1.1.1 Science Communication

The Science Communication refers to the process of communicating, teaching, promoting science related issues, and fostering amazement in the face of scientific facts and breakthroughs. The definitions of science communicators and viewers are complicated because each category has a different degree of proficiency and scientific literacy.

Science communication refers to a range of techniques that make scientific principles, procedures, know-how, and research approachable, clear, or valuable to non-specialist consumers. No previous knowledge of Science, Technology, Engineering, and Mathematics (STEM) is necessary for, scientific communication audiences. There are no restrictions about how or to whom science can be communicated. It is a research area that draws from a variety of communication fields and techniques and therefore is broad in scope. A diverse array of fields in the social sciences, arts, and sciences are incorporated into the academic analysis of science communication, which focuses on explaining science to various audiences. This contains studies, analyses, and discussions of the scientific communication standards used by practitioners. Today, science communication is primarily done through posts on social media, illustrations, and marketing materials. As we will see in the cases throughout this guidebook, colleges are also taking on a progressively larger role in innovation and digital and scientific sales and marketing ("Stunning Science Communication", 2022). They serve as forums for the discussion of scientific mysteries and for the exchange of solutions among experts. Youthful experts can interact with experienced, more accomplished researchers at conventions since they gather experts of varying generations (Swanston, 2019).

1.1.2 Risk Communication

A science-based strategy for successfully informing individuals regarding possibilities is called "risk communication." Their society, their possessions, or themselves are at risk. Risk communication is described as the "act of disseminating insight into the nature, extent, severity, and control of a risk between relevant parties" (Covello, 1992)**.** Additionally, risk communication goes beyond the simple dissemination of scientific, technological, and legal knowledge to take into account the perspectives and beliefs of the target audiences. A significant component of this method of communication is the views and attitudes of the impacted society. Risk communication seems to be about having two-way communication that occurs when an organization or institution teaches and is taught by individuals of the community people. Additionally, risk communication enables individuals to comprehend and minimize risks by conveying the likelihood of both negative and positive outcomes. Risk communication enhances impacted people's perspectives of the early attempts in a way that is supported by scientific evidence. It also enables individuals to take part in decision-making regarding how risk must be handled. Fundamentally, risk communication is frequently connected to an anticipated occurrence that looks at the results of actions or exposure to the environment (REYNOLDS & W. SEEGER, 2022). Combining two-way communications, participatory processes, and dispute settlement can be used to characterize risk communication (Fischhoff et al., 2022).

Additionally, risk communication happens when all parties involved are knowledgeable, the procedure is equitable, and everyone should have the freedom and opportunity to work out any communication issues that may develop.

1.2 Scope of the Study

Risk assessment includes science and risk communication as key elements. General understanding and acceptance of scientific and risk mitigation judgments are aided by it. Getting information from people involved in scientific research and risk assessment is also essential if you want to increase your knowledge of science and risk. Science and risk communication is an essential component for the openness of science and risk assessment, and the effectiveness for science and risk analysis and management greatly depends on its efficiency.

1.3 Statement of the Problem

An effective statement of the problem condenses the challenge that your process improvement effort will aim to address into one or two sentences. The drawbacks of the current situation are frequently listed in an indicator of the critical together with an explanation of their significance. Explaining the study's proposal for a problem-solving model strategy provides general guidance on crisis. However, there is limited integration of these principles into a structured model specifically designed for social media environments. As a result, organizations lack a clear, evidence-based framework for designing, delivering, and evaluating risk communication messages across digital platforms. A problem statement identifies an issue that is now occurring and must be resolved. This study addresses the need for a systematic model for science and risk communication on social media platforms. The problem statement serves as the primary focus of any investigation.

1.4 Purpose of the Study

This study makes three significant contributions, the first contribution. Firstly, it will fill the literature gap to explain how science and risk can improve ways of communication, which is less investigated in the existing literature. Secondly, it will examine different types of organizations utilize social media for science and risk communication. Lastly, it will investigate the science communication and risk communication.

1.5 Objectives of the Study

The objectives of the study are given below.

- To identify the ways to improve science and risk communication.
- Investigate the types of numerous organizations use social networks for scientific and risk communication.

1.6 Research Questions

The research questions are given below.

RQ1: What are the best ways to improve communicate about science, and risk?
RQ2: How different types of organizations utilize social media for science and risk communication?

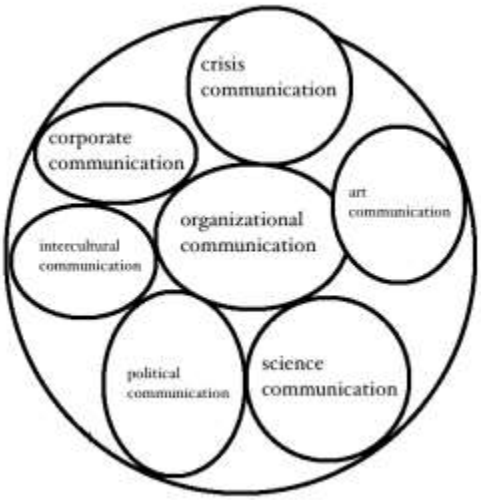
1.7 Delimitations

This research is limited merely for individuals.

2. Literature Review

2.1. Science Communication

Science and innovation are present in almost every facet of modern society. Because of this, individuals are becoming more compelled to consider other factors, including their personality traits as well as other factors, when making significant life choices, for instance those involving healthcare coverage, food standards, and climatic changes. The conduct of science is inherently unpredictable, open to frequent mistakes, and potentially influenced by one's own beliefs, prejudices, and career aspirations because it is a human enterprise. Nevertheless, research uses a special, regulated method to generate factual information, but over time, the procedures and standards of science lead to a solid collection of data (National Academies of Sciences et al., 2022). A study published in the *International Journal of Environmental Research and Public Health* examined how social media influences people's protective behavior during the COVID-19 pandemic. The research used Protection Motivation Theory and survey data to analyze how online health content affects public awareness and behavior. (A. I., & Fazea, Y. 2023)



2.2. Risk Communication

However, due to its popularity as a helpful language, the "language of risk" is increasingly gaining ground in a variety of spheres of our daily lives. Consider the probability-based language used in today's modern weather predictions (There is a 50% possibility of rainfall today). This change just happened recently. Likely, several individuals would still find it difficult to explain what a 'chance of rain' entails if questioned. However, the ability to employ this language successfully grows with experience, and we can anticipate seeing many more instances of it throughout the future merely since it is the best method to convey the idea that reality is composed of a variety of alternatives at any given moment (Ropeik & Gray, 2022). The study emphasizes that effective science communication strategies are necessary to counter misinformation and strengthen public trust in health authorities. (M., Al-Qadasi, Y., & Dureab, F. 2024). A study in the *Journal of Medical Internet Research* analyzed more than 539,000 social media posts from public health experts and

pseudo-experts. The research found that emotional and moral language in messages significantly affects public engagement and trust. It also highlighted the challenge of pseudo-experts spreading misleading information during crises, which complicates science communication efforts.(Raschid, L., & Lerman, K. 2025).

3.Ways to Improve Science Communication

No matter if the goal is to enlighten, educate, or engage the target audience, regardless of whether the communications take place in journalism networking, social networking sites, exhibitions, or anywhere else, the guiding elements listed below will help you in evaluating and creating your science communication efforts.

3.1. Trustworthiness and Scientific Methodology

All of the discrete components in this foundation concentrate on the idea of trustworthiness. Trust in the subject as well as the means of communication is essential for effective science communication. This aids the viewer in making defensible choices regarding the reliability of knowledge and its providers.

3.2. Presentation and Attitude

By emphasizing the presentation of scientific material and user engagement, the components in this foundation all work to improve the value of encounters. In order to maintain an active conversation with the audience in the difficult environment of the "attention economy," communication must be accessible, attractive, and understandable.

3.3. Connections to Societal Structure

The components of this foundation are concerned with the demands of the public and, further globally, the social goal of science communication. The potential of science communication to serve as an ethical bridge among society and the sciences and to positively influence both defines the quality of communication.

3.4. Structure, Topic, Setting, and Specific Information

Employing the criteria demands a balanced approach due to the variability within the domain of science communication. The structure, topic, and communication setting must all be considered while using indicators.

4.Ways to Improve Risk Communication

4.1 Outline of the Available Data and Suggestions

Identifying crucial elements to incorporate into the communication was one of the first steps, which required looking for risk communication techniques or representation techniques employed by other local and international risk assessment bodies (such as risk grids, pictorial representations).

4.2 Two-Way Communication

Improvement and conversation go hand in hand, but although upper edge communication has its place in informing the public about a planning process, collaboration and the use of two-way communication can improve any endeavor. The greatest way to convey risk and assess how the

risk message has been taken, according to risk communication experts, is through two-way communication (9).

4.3 Considering the Various Viewpoints

Risk is a given in the domain of development (and in all disciplines), but different individuals within a group may emphasize some risks over others. It seems to be crucial to comprehend the various viewpoints of as numerous individuals as feasible in order to articulate the hazards of a planned project development properly.

4.4 Loyalty

In any kind of growth, there is a demand for people to believe that growth is being done. In the past, when builders entered an area without any of the society's loyalty, bad things may have happened. Risk communication builds confidence by notifying society of potential dangers or negative effects associated with a planning process, and because it is transparent, it reduces mistrust.

5.Methodology

The observational method of this research led to the decision to employ a qualitative methodology instead of a quantifiable strategy. The investigation of individuals' perspectives of science and risk communication involved the collection of greater firsthand observations, sentiments, thoughts, and comprehension of the variables. Additionally, this method enables a thorough evaluation of the problems involving science and risk communication, including the individuals' attitudes toward the field as well as the state of risk communication in the scientific and other organizations they reflect. Furthermore, it evaluates different organizations through social media for risk communication in a scientific way. It, moreover, permitted discussion of the most intriguing findings, which would not have been possible using a quantitative approach. Successful countermeasures to the outbreak need correct comprehension and successful science and risk communication execution as the outbreak evolves.

6. Data Analysis

This study adopts a qualitative content analysis approach to examine how organizations use social networking sites for risk communication. The types of participants (World Health Organization, n.d.), social networking uses (U.S. Department of Homeland Security, 2013), and communicative elements were used to identify and assess the publications that were returned from the research (Schiavo, 2014). The data consisted of peer-reviewed journal articles, policy reports, and documented social media campaigns focusing on risk and crisis communication. A purposive sampling strategy was employed to ensure relevance to the research objectives. The intended audience, material, different social media platform varieties, and participants were among the recurrent traits that were found while analyzing social media campaign tendencies conceptually. A thematic analysis method was used to interpret the collected material. All selected publications were read multiple times to identify key concepts. Open coding was applied to extract meaningful segments of text. Codes were generated inductively from the data and organized into preliminary categories. The Codes were grouped into broader themes aligned with the research objectives. These classifications have included the types of firms and how they use social networking sites for

risk communication, patterns in social media campaigning, and recommendations for the future path. A chart is used to display the study.

Figure 1: Aspects defined for data analysis

Participants	• Public health decision-makers: Ministries of Health, government agencies, other government departments at the national level. • Public health influencers: experts, academic institutions, research institutions, health partnerships, foundations, intragovernmental, nonprofit organizations, and non-governmental organizations, including leaders of the organizations mentioned above.
Social media purposes	• Social networks: web-based platforms that allow users to create an account, establish a profile, and interact with other members. Examples: Facebook and Twitter. • Media sharing networks: social media that provides users the ability to upload photos, videos, or slide presentations and share in a public forum. Examples: Instagram and YouTube.
Communication concepts	• Fear appeal: Message concepts that developed to evoke fear and refer to anemotional response. • Action step: Message concepts that explicitly highlight specific recommended actions. • Rewards or benefits: Message concepts that emphasize on key advantages associated with recommended change. • Perceived threat: Message concepts that aim to influence existing perception about group-specific risk levels for a specific health condition; attempts to elicit the kind of rationale response that is information-based. • Perceived efficacy: Message concepts that target people's perceptions about their own ability to perform recommended actions and behavior, as well as the impact of such actions on the actual threat. • Hope: Message concepts that suggest that the recommended behavior will enable people to achieve the kinds of milestones or changes they may hope for.

7. Results

The research utilizing the specified keywords produced 207 results from PubMed, ResearchGate, databases searched, and Google Scholar. The Google searches were loaded into Covidence to speed up the methodology by using a comprehensive and overview analysis. A few papers were examined for the topic and abstract review. Among the latter, many publications were completely included along with a thorough examination, while a few pieces of research were flagged as being unnecessary. The key findings were used to extensively examine the publications: (1) social networking sites; (2) participants; (3) important communication; and (4) lessons were learned. The

implementation of social networking sites for risk communication between participants, media engagement patterns throughout the various outbreak seasons, and insights gained for the successful use of social networking sites for risk communication will all be extensively examined.

7.1 Numerous Organizations Use Social Networks for Scientific And Risk Communication

7.1.1 Governmental Institutions

US-based governmental institutions depending on the outcomes. The bulk of the studies—16 in total analyzed how government officials and institutions communicated risk information through social networking sites. Throughout the research by (Sesagiri Raamkumar et al., 2020), healthcare institutions from Singapore's Ministry of Health, the U.S. Centers for Disease Control and Prevention, and England's Public Health England used Facebook to measure the interests of the public in respective outreach initiatives. It was discovered that every organization has a distinct emphasis. For instance, the postings from the CDC and PHE mainly focused on safety precautions, but the postings from the MoH were much more situation specific.

However, (Zeemering, 2020) examined local governmental agencies in Atlanta, San Francisco, and Washington, D.C. All three organizations make heavy use of Twitter. San Francisco has 75 current Twitter accounts, whereas Atlanta has 26. Washington, DC has 54 effective municipal Twitter accounts. Since then, Atlanta has been using Twitter as a component of its quick reaction and regular communications to give citizens and entrepreneurs actual information. The broad dissemination of data regarding downtown office shutdowns during the beginning of the epidemic is one instance of their usage of social media. Additionally, the city used Twitter to disseminate information, make notes about other departments and agencies, and represent agency collaboration that was governed through their social networking site policy statement. This is demonstrated by their social media site structure, which consists of 133 units (or separate user profiles) that are connected by 434 connections.

Compared to this, San Francisco, where Twitter originated, has aggressively used Twitter, including both inner communication collaboration and marketing to the outside world. According to the primacy evaluation, encompassing whereby one (the number of projectiles diverted from the assigned Twitter account) demonstrates city organization community engagement to other departments within the city administration and also general citizen participation. Throughout, primacy (the number of other account holders who have clickable buttons toward the assigned Twitter profile) reveals the system is composed of all city departments. The social networking site's graph demonstrates 905 connections, or links that unite the endpoints via mentions and follows, and 728 endpoints, or distinct Twitter accounts.

By combining text analytics the method of transforming textual data properly to obtain insights and knowledge and dynamic evaluation a mixture of analysis tools that provides some guidance, social modeling, and multi-agent structures within connectivity scientific and communications system concepts, with Twitter data, (Wang et al., 2021) examined how governmental entities, including state- and federal-level agencies across the US, tried to communicate across multiple channels. The CDC, HHS, FEMA, and WHO are the institutions with the highest magnitude of ties to other organizations, according to their Twitter accounts. The WA DOH and NY DOH have more advanced degrees than some other governmental bodies. Structural Equation Modeling showed that misinformation spreads faster when users rely on emotional or unverified sources.

The research highlights the importance of strategic risk communication and media literacy to control infodemics during health crises. (Y., & Wang, H. 2024).

(Sutton et al., 2020)'s study also highlights the social networking site tactics used by public health authorities with a US presence. Seven unique communication times were found by the research. Each era, or "period," is marked by a certain structure of communication concentration, as evidenced by the employment of recognizable hashtags. This led to the additional conclusion that, depending on the phases of communication during the initial 60 days of the epidemic, governmental public health departments place varying focus on both individual and group activity, motivational maintenance, and the creation of society's standards. International setups for governmental organizations.

7.1.2 International Setups for Governmental Organizations

Generally, governments choose the most widely used social networking platform in their region to interact with the general public. One of the most popular networking sites, in China, is Weibo (also known as Sina Weibo), which is utilized by the administration to communicate. Weibo information was analyzed by (Liao et al., 2020), who discovered that even the most engaged. The posts from governmental bodies were much more likely to speak about regulations, regulations, governmental acts, and tangible assistance. According to Zeng's analysis from 2020, the 134 Center for Disease Control profiles in China saw a surge in members and fresh tweets, including 1.4 million additional fans and 60,000 new Twitter posts. 90% of the Twitter posts discussed public medical emergencies. The CDC used four main elements to interact through the micro-blogging site Sina Weibo, including regular reports on the organization's activities: public awareness campaigns, and the customary actions and commitment of the anti-epidemic leaders, particularly the CDC.

The Facebook was used by the authorities in Vietnam and the Philippines for a variety of channels, including the Ministry of Health and Local Government Units (LGUs). In both states (La et al., 2020), Facebook is regarded as the main source for getting or seeking more information. The LGUs primarily used Facebook throughout the Philippines to give daily reports as well as findings on regional conflict mitigation and recovery, promote civic participation, focus on promoting self-protective behavioral patterns, offer additional frequent updates on the local crisis event, and identify misleading information, falsehoods, as well as other concerns about the crisis (Flores & Asuncion, 2020).

Researches by (Rufai & Bunce, 2020; Prayoga, 2020; Drylie-Carey et al., 2020) targeted certain public figures on Twitter. Along with Tedros Adhanom, a member of the World Health Organization (WHO), and Ursula Von der Leyen, president of the European Union (EU), Drylie-Carey concentrated on European leaders in four of the world's most afflicted European nations: the United Kingdom, France, Spain, and Italy. This study demonstrated that leaders utilize visual representations as their primary means of communication and are cognizant of their value in improving their leadership abilities. For example, they included hashtags, visual materials, and the whole media briefing footage in the article.

(Purnomo, 2020) examined four accounts on Twitter for Jakarta public transportation systems, including LRT (Light Rail Transit), MRT (Mass Rapid Transit), BRT (Bus Rapid Transit, also known as TransJakarta), and Commuter Line, because of the huge societal limitations in Jakarta,

Indonesia (commuter line system). According to the results of the analysis, the majority of the Twitter posts' material throughout the outbreak was related to transportation, risk, and societal communication. The research divided the public transportation administration of Jakarta's utilization of Twitter into 5 groups: knowledge about some timetable adjustments, scenario updates about the state of the terminals' passages, risk communication, psychological support, and customer data.

7.2 Agencies, Institutions, and Non-Governmental Organizations

7.2.1 Social Media Agencies and Sources

Social media is used by media organizations and businesses to highlight concerns about public health. (Yu et al., 2020) examined and contrasted the latest news from El Pais and El Mundo, two influential Spanish publications, during the crisis on Twitter. The qualities of each kind of mainstream media and their corresponding subjects on social networking sites were influenced by that category of media. The center-left mainstream press concentrated primarily on family and survival concerns (livelihood), whereas the center-right mainstream press concentrated primarily on news about the Spanish capital "Madrid" using a mixture of recommender systems (a form of statistical method for having discovered the abstract "topics" in a document collection) and the connectivity method of analysis (the procedure of trying to investigate social systems by employing the technique of channels and pattern recognition).

In addition to Twitter, the mainstream broadcasting and entertainment sectors used YouTube to highlight preventative measures to reduce communal transmissions. The initial analysis by (Basch et al., 2020) found that out of the hundred most popular YouTube clips between January 2020 and March 2020, mainstream media had the greatest upload rate (80 % of the total). Out of all the videos created by the mainstream press, the warning to remain inside received the most views (81.3%). But even so, according to the second paper (Basch et al., 2020), by March 20, 2020, amusement broadcast TV had posted the majority (57%) of the most popular videos in this analysis, accounting for nearly 55% of all total combined views, and the series of films posted by sources of news had significantly decreased (from 85 percent to 19 percent). Besides this, the most popular videos from the entertainment field promoted staying inside. (Li et al., 2020) discovered the two most significant characteristics of YouTube featured videos were news networks and entertainment shows. Nevertheless, it was discovered that, compared to corporate and governmental videos, online media and entertainment news video content were significantly more inclined to contain incorrect facts. Additionally, (D'Souza et al., 2020) examined the 113 videos concerning the pandemic with the highest viewership. They discovered a different discovery, namely that news outlets were much more likely to publish helpful clips than deceptive ones. The data can be on the forecast, consequences data, or frequency and occurrence.

The People's Daily, among the large government news outlets in China, has changed the way news is reported by focusing on social media interaction with the common public. (Ngai, 2020) observed that prevention and treatment messages presented in a variety of different formats were capable of generating a significant number of views, employing Sina Weibo as the biggest social media platform used. An increased level of interaction between individuals on social media was also influenced by content and presentation. The employment of a narrative form in postings about disease prevention significantly increased the number of comments and shares received from the Chinese audience, whereas connections to outside sites encouraged spreading.

7.2.2 Organizations Providing Healthcare and Medical Professionals

The number of social networking connections for healthcare workers has increased. According to (Pérez-Escoda et al., 2020), this development can be seen on three platforms of social media: Instagram, Twitter, and YouTube. Furthermore, throughout a worldwide epidemic, healthcare practitioners made use of social media to encourage global cooperation and quick transmission of information within their group. According to the research by (Kudchadkar & Carroll, 2020), the worldwide pediatric intensive care group was encouraged to use the hashtags #PedsICU and #COVID19 in Twitter posts. Seventy-two percent of all #PedsICU material was tweeted by healthcare practitioners, while non-physician healthcare professionals produced the most interaction on health twitter posts (46 percent). Six nations are included in the span of usage of the hashtag, with North America and Australia producing the majority of tweets. Accessible materials, such as hyperlinks to current research, narrative assessments, and instructional videos pertinent to the medical management of disease, were the most frequently posted Twitter posts on Twitter

7.2.3 Intellectuals, Thought leaders, and Youngsters

On January 1, 2020, 114,145 posts had been published by 337 Twitter accounts. (Kamiński et al., 2020) examined 17,331 Twitter posts for their health content. The majority of Twitter posts came from various parties, including academia, recognized state entities, and medical organizations. Celebrity and political tweets fare better compared to those from medical and scientific organizations. The average number of accounts for famous people was higher than those for health organizations. Legislators (259, 0.174%), health organizations, and entertainers (average nominal, comparative views: 14,918, 0.036%) earned the most "likes" on Twitter (231, 0.007%). Legislators (130, 0.004%), health organizations (130, 0.005 percent), and personalities (2,366, 0.005%), all published the much more retweeted statements (55, 0.041%). The number of retweets and comments reached its peak in March 2020, and the general mood of the Twitter posts was progressively improving. Politicians and celebs wrote remarks with a favorable tone, whilst scientists and healthcare professionals frequently used a derogatory phrase. Positive articles received more views and comparative comments than negative ones.

In parallel to this, (Mutia Sadasri, 2020) investigated the postings on social media made by famous people chosen by Indonesia's BNPB (Badan Nasional Penanggulangan Bencana, or National Disaster Management Authority). Because of the significant effect that online consumers have in Indonesia, the government was working with well-known personalities to monitor public opinion on COVID-19 on social networking sites. The findings indicated that their self-efficacy material placed a greater focus on the individual protective concept than on symptomatic data. A combination of 48 (67.6%) of the materials focused on the preventative and health regimen. Additionally, the Brunei group aggressively promoted social exclusion programs in Brunei Darussalam by using social networking sites like Instagram, Twitter, and Tik Tok. Using the qualitative research method (QCA) of young people's Instagram and Twitter postings, (Mohamad, 2020) discovered that there existed five evident narratives, including the discourses of fear, commitment, irritation, enjoyment, and resistance.

7.3 Marketing Patterns on social media during the Crisis (COVID-19)

The majority of the researchers used Figure 2's global epidemic timescale to establish their critical points, which included:
1) noting the schedules on which the nations revealed their first COVID-19 situations,
2) declaring the epidemic, a nationwide global epidemic,
and 3) noting the deadline on which the WHO proclaimed COVID-19 a Public Health Emergency of International Concern (PHEIC) in January 2020.
According to (Sesagiri Raamkumar et al., 2020), both MOH and PHE had their busiest months in February. Although February was MOH and PHE's strongest period, CDC produced the most COVID-19 postings in March, coinciding with the timeframe whenever the WHO proclaimed a disease outbreak in March 2020.

Research	State	Timeline	Significant circumstances
La (2020)	Vietnam	Period 1: before the first case was confirmed (January 23, 2020), Period 2: after the first confirmedcase of COVID-19 infection onJanuary 23 to February 26, 2020. Period 3: February 27 to March 5, 2020, with no new patients detected and the country entered a pause in the timeline of the outbreak Period 4: March 6, 2020, until now, marked by the second outbreak with the confirmation of the 17th patient.	Fake news on social media mostly emerged during period1 and period 4. Responses to combat such mis/dis-information were made in both periods 2 and 4, formalized in a government decree in which anyone spreading fake news could be fined between (US$430-860), around 3–6 months' worth of basic salary in Vietnam.
Yu (2020)	Spain	Pre-crisis period, lockdown period, and recovery period.	El Pai's focused the most on public health professionals and real-time alarming ("Pandemic Update") information during the first two periods. El Mundo coverage on Twitter focused on the state of alarm and confinement ("Lockdown") related information. During the recovery period, the proportion of general

			political news ("Politics") update is largely increased in El País, being the third most prominent news frame in this stage, while there were no such changes for El Mundo during the recovery period.
Van Dijck & Alinea (2020)	Netherlands	Crisis response stage and the smart exit strategy stage	The crisis response stage was characterized by the emergency response mode of the immediate lockdown, Smart exit strategy stage shifted attention from the medical emergency response

Figure 2 Schedule for the Netherlands, Spain, and Vietnam

7.4 Organizational Communication Patterns

7.4.1 An Agency based in the United States:

According to (Wang et al., 2021), several groups began disseminating information about the epidemic at various times. To spread information on COVID-19, the WHO and American governmental agencies, including federal and state-based organizations, tweeted a median of approximately four to five Twitter posts throughout the week and two to three Twitter posts over the weekend from mid-February to mid-March.

7.4.2 International Organizations

(Sesagiri Raamkumar et al., 2020) discovered that effective communication started from governmental health organizations with exterior assets, operational processes, points of view, and opinion pieces earliest, accompanied by governmental health departments, and afterward, constitutional decision-makers. This was focused on the assessment of the Facebook profiles possessed by the MoH, the CDC, and PHE in Singapore, the US, and England. For instance, on the median, provincial and national health organizations began sharing information and expertise in mid-February, mid-March for government participants, and late January for government health organizations. In comparison to other players, state medical authorities also made more conversations about spatial awareness, plans, and advice, as well as the early handling of rumors.

7.4.3 Global Organizations

Depending on Weibo data, (Liao et al., 2020) pointed out that posting progress reports, rules, standards, and government measures on personal pages decreased as the epidemic progressed in China. The above-mentioned material was shared by government postings consistently or much more frequently. Individual postings changed their messages simultaneously to show greater sympathy for the impacted people and community. Giving training and assistance, applauding, and

having empathy in government postings ultimately increased somewhat as the pandemic progressed and communication trends turned to compassionate material.

Related to regulatory communication, research by (van Dijck & Alinead, 2020) in the Netherlands revealed that the initial phase of the emergency preparedness step was marked by elevated variability and uncertainty, once knowledge and technology, and scientific proof decision-making nearly interlaced with the general populace semblance because they were both under insane time stress. The administration used a deliberate and covert reaction plan to the communication plan in mid-February and the beginning of March. The administration emphasized logical explanations throughout this time and leaned on respected medical professionals. After that, in the phase of wise departure, the government leaders progressively became conscious of the necessity of using specialists, including the difficulty, and non-medical specialists from civilized society to create exit ideas for the future. The informational methods created by both scientists and politicians, though, were also under attack from non-experts throughout this period.

7.5 Examples of Worldwide Social Media Campaign Categories

(Sesagiri Raamkumar et al., 2020) used to categorize tendencies into six categories: precautionary measures, condition updates, disease knowledge, general comfort, falsity rectification, and many others (admiration, study, screening and treatment, and miscellaneous). The CDC and PHE articles were mostly on prevention methods, in contrast to the more varied subjects from the MOH, where no issue accounted for more than 30% of the total postings. Protection strategies and status updates were the MOH's two biggest topics. The CDC and PHE did not produce any postings to explain and rectify any misleading data, whereas the MOH published 16 articles to address misconceptions.

In Spain, (Yu et al., 2020) examined the Twitter social media feeds of two major Spanish publications, El Pas and El Mundo. The mainstream media themes for El Pai comprised *Livelihood*, *Public Health Professionals*, *Pandemic Update*, and *Politics*. As the disease spreads, the team recommends changes. The most important content structure during the, which was before the phase, was *Livelihood*, and the structure connectivity revealed that even this structure seemed to have a close correlation with *Politics*, *Economy*, and *Public Health Professional*. The relationship with *Madri* became more prominent during the course of the subsequent two eras. The *State of Alarm* element became more prominent during the second stage, whereas the *Politics* element received less attention. The disease outbreak media frameworks (*Pandemic Update*, *State of Alarm*, *Public Health Professional*, and *Covid Information*) were waning in prominence throughout the rehabilitation process. *Madrid* remained El Mundo's key media framework all of the time, while the percentage of this issue shifted significantly from the middle to the third. Throughout the initial multiple phases, this framework has the greatest linkages to *Lockdown* and *State of Alarm*, while during the subsequent two phases, *Madrid* and *Covid Information* have a higher correlation.

(Xu et al., 2020) categorized Chinese social media information on Weibo into three main classification areas: information and expertise, political situation, and government response. The entries have been further divided into reports and data on the condition's etiological factors, statistical features of the epidemic, officially or privately advised precautionary measures, and details on the administration's responses to the crisis. The *uniform flow of concern* was the most mainstream consumer attitude, making up 69.72 percent of all responses. This includes expressing

doubt; feeling terrified, anxious, and apprehensive; and expressing caution. However, there had been some overall good mood, particularly among individuals who showed relaxed and upbeat views, along with some negativity, which was also seen in the statements of rage. 47.87% of postings that self-reported consumer responses to content were made, making public response the least stable communication. Self-reported preventive behavioral measures such as handwashing more consistently, and postponing any unneeded travel, meetings, and engagements were among the responses. The general populace also engaged in actions that may put their well-being in danger, such as continuing to live according to their pre-epidemic routines and routines and self-evacuating from Wuhan.

7.6 Communication Vogue

Additionally, (Wang et al., 2021) examined the messaging patterns used by US government entities at the national and state levels. Initially, it was believed that emergency risk communication on plans, orders, and regulations that promote the public's protective activities was inadequate. Contextual content, that describes the current epidemic circumstances and external assets that point viewers to other channels, headlined the messaging. The second essential communication was then supported by tactics and directives, structure, and thought and analysis. Furthermore, there had been discrepancies in how various authorities had assessed the risk. Initially, organizations informed Americans about low-risk levels. The messaging began to move to the entire public when more instances amongst youngsters and the vast majority of the population were recorded, including hospitalization statistics and instances that had disseminated across the neighborhood.

(Liao et al., 2020) also examined Weibo users and official posting material. In comparison to personal account articles, where they were more likely to communicate data on general populace reactions to the pandemic, government department updates were much more likely to communicate data about policy initiatives, recommendations, and authoritative decisions ($\chi 2\ 1 = 14.50$, $P < 0.001$), as well as tangible assistance ($\chi 2\ 1 = 32.50$, $P < 0.001$). Private account postings were so much more likely to just be categorized as emotive exchanges ($\chi 2\ 1 = 30.50$, $P < 0.001$), which included conveying concern about the disease and showing compassion for those who were afflicted. The governmental positions, on the contrary side, were more likely to commend individuals or groups, such as healthcare professionals ($\chi 2\ 1 = 08.70$, $P = 0.003$).

7.7 Visual Data and Keywords/Hashtags

Although during the crisis, visual data like pictures and videos were extensively used in the crisis communications of political figures. Throughout the initial days of the epidemic, (Drylie-Carey et al., 2020) examined how government parties across the most afflicted European nations used graphic data to emphasize the methods of suggestions provided by public health professionals on Twitter. According to the research, Ursula von der Leyen, Emmanuel Macron, and Boris Johnson were among the individuals who used personal videos, pictures, and re-tweets of social networking sites' material the most frequently (25 percent, 19 percent, and 15 percent, respectively). The conversation about improving leadership and credibility was enhanced by the utilization of particular materials that revealed the essential aspects of interaction.

The leaders also made use of visual resources in the context of picture genres, with Boris Johnson posting the most infographics overall (29.4 percent). Considering 70.5 percent of the examined

Twitter posts from Boris Johnson's profile using a keyword, # usage was common. By 92.2 percent, 83.9 percent, and 78.1 percent, respectively, Ursula Von Leyen, Pedro Sanchez, and Giuseppe Conti also often used hashtags. Emmanuel Macron, alongside Ursula von der Leyen, seemed to have the greatest proportion of movies that were shorter than 180 seconds in length. He also had one of the quickest average videos posting times. On the other hand, Pedro Sanchez and Tedros Adhanom had the longest average length of video uploaded, both measuring in at 49 minutes and 49 seconds.

To spread information in real-time within the worldwide pediatric intensive care group, hashtag usage proved beneficial. The hashtags #PedsICU and #COVID19 should be used interchangeably in Twitter posts on pediatric emergency medicine and the coronavirus illness outbreak of 2019. The #PedsICU hashtags have been used 5,202 times during the annual Society of Critical Care Medicine Congress by 1,245 different individuals, which represents a significant rise in usage. Throughout late February to early March 2020, there was a substantial increase in the COVID-19 hashtag's usage along with #PedsICU. The usage of COVID-19 keywords in Twitter posts including #PedsICU increased from 1345 to 4238 during the course of the subsequent two times (weeks of March 7–13 to March 14–20), as increased the number of individual viewers. The #PedsICU discourse on Tweets has been dominated by COVID-19 keywords since its first peak, accounting for 69 percent of Twitter posts and engagements.

7.8 Public Participation

(Sesagiri Raamkumar et al., 2020) demonstrated that there had been a significant rise in public participation indicators during the peri-COVID-19 timespan. A significantly larger number of responses were made in 2020 (peri-COVID-19, average = 2.2) in comparison to 2019 (pre-COVID-19, average responses per publication, 15.6), according to the MOH, which saw a 7-fold rise in comments overall. The Centers for Disease Control observed a roughly ten-fold rise in average views per post from 2019 to 2020 (average = 240.9) and a nine-fold growth in the targeted respondents for each article between 2019 to 2020 (average = 230.7). The views of each article for PHE increased the most, about five times, from 2019 (average = 102.6) to 2020 (average = 478.9).

The kinds of public networks are also correlated with public participation. From January 2020 to April 2020, 152 Twitter posts from Indonesian President Jokowi (@jokowi) about COVID-19 were examined by Prayoga (2020). The analysis discovered that the majority of the retweets and likes that Jokowi obtained were contained in the Twitter posts with pictures and videos, which made up 80 Twitter posts with pictures (53 percent) and 25 Twitter posts with video content (17 percent) in total. Focusing on Weibo data, Liao's research (2020) evaluated the public's participation and the administration's reaction in communication during the initial phases of the pandemic. A medical center in Sichuan Province, China, and the Municipal Health Commission (MHC) in numerous Chinese cities, particularly Wuhan, Zhuhai, Shanghai, and Beijing, represented some of the most registered users in the healthcare system on Weibo. The Hubei Branch of the Red Cross Society of China, which is primarily in charge of increasing contributions to help afflicted individuals during the outbreak, emerged as the most proactive governmental agency throughout the non-health field. (Pérez-Escoda et al., 2020) assessed the social media community awareness of healthcare workers and telecommunication networks specializing in health over a duration of six months in Spain, looking at the development between various social media sites. The study suggested that between Twitter, Instagram, and YouTube, almost every

account examined had a gain in subscribers during the emergency trimester in comparison to the previous trimesters.

8.Conclusion

Our contemporary research has emphasized the value of recording and studying the discussion to identify instances where standpoints appear to be convergent. A serious conversation about fundamental scientific concepts and relevant social challenges, including risk, is important. These conversations seem to be as intricate as the systems being addressed in nature.

The efficient dissemination of science and risk communication is anticipated to be a serious concern, despite the fact that there are numerous communication problems in the wake of an event. Efficient risk communication is backed by high-quality science and credible sources. However, these alone are insufficient. Human characteristics like compassion and trustworthiness are especially crucial in times of intense pressure. Planning, preparing, and practicing a phased communication plan are required.

In addition, scientific details need to be carefully gathered and delivered throughout a situation that jeopardizes the safety of employees and their way of life for it to be understood by audience members. People now are closer linked than before because of immediate access to a steady source of information, particularly on social networking sites, during earlier worldwide epidemics. Social media makes accurate and available assets to spread fast across consumers are exposed, which is important for risk communication, which requires the information to be communicated authentically.

Finally, the corporations should be able to decide how far they want to go in identifying and correcting disinformation instead of becoming more aggressive in sharing factual data through social media. Institutions must also establish a powerful social media strategy that governs how team members and collaborators interact on various social media platforms throughout a crisis affecting public health. At the core of communication readiness and process optimization, this legislation must include specific provisions for combating disinformation and inconsistencies.

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