Disaster Relief Logistics

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Abstract

Communities face major challenges as a result of disasters like earthquakes, which call for prompt and well-coordinated responses. Businesses are essential in these circumstances because they use their networks and resources to help. This study looks into how local and global businesses communicated during the crucial relief phase of the 2023 Kahramanmaraş earthquake using Platform X. Thousands of posts were examined, and the data was annotated to look into brand behavior. The results indicate that transformational posts focusing on emotional resonance, particularly those incorporating images, are the most effective in driving public engagement during disaster relief efforts, while local companies excel in consistent, community-focused messaging and international corporations leverage large-scale initiatives like corporate

philanthropy to achieve higher peaks in engagement. By offering practical insights into successful corporate social responsibility (CSR) communication tactics, this study aids in the logistics of disaster relief.

Keywords: Corporate Social Responsibility, Data Analytics, Disaster Management

1 Introduction

When disasters like earthquakes strike, everything can change in the blink of an eye. Homes are reduced to rubble, normal life grinds to a halt, and communities are left grappling with uncertainty. In these moments, the need for a quick and coordinated response becomes undeniable, as swift action can save lives and help communities recover faster. The earthquake that hit Kahramanmaraş, Turkey, in early 2023 was a powerful reminder that disaster response isn't solely the responsibility of governments or aid organizations—businesses also play a crucial role. Companies have the resources, networks, and ability to mobilize quickly, making them key players in providing aid and supporting communities directly.

As supply chains are disrupted and the demand for assistance rises, social media becomes more than just a communication tool—it becomes a vital bridge connecting those in need with those who can help. It allows for the rapid spread of information, facilitates coordination, and provides comfort through public engagement. Studying how companies interact with communities through social media during such critical periods offers valuable insight into their role in disaster relief and the far-reaching effects of their communication efforts.

This study explores how 60 local and international companies used Platform X (formerly Twitter) to communicate in the aftermath of the Kahramanmaraş earthquake. By analyzing posts during the critical relief phase, the research seeks to identify patterns in corporate responses, classify communication types, and assess the effectiveness of these efforts. We aim to address gaps in current disaster logistics research, particularly the intersection of corporate social responsibility (CSR) and public engagement during emergencies.

Prior research highlights the importance of timely and transparent corporate communication during crises (Abitbol & Lee, 2017). While their study primarily focuses on CSR messaging through Facebook, effective public engagement and message resonance principles extend across social media platforms. Social media platforms offer brands a unique space to interact directly with their audiences, facilitating real-time information sharing and engagement (Cheng et al., 2018). Studies show that when companies demonstrate empathy and proactive involvement during disasters, consumer trust and loyalty tend to grow (Cheng et al., 2018).

However, there remains limited exploration into the types of messages companies share and how these messages influence public perception and engagement.

In this study, we gathered thousands of tweets from companies across diverse industries, including consumer goods, telecommunications, and logistics. Each post was categorized into three types: informational, transformational, and interactional. Informational posts aim to provide facts or resources, transformational posts focus on building emotional connections, and interactional posts encourage dialogue and participation. This classification allows us to better understand how different industries engage with the public during disaster relief efforts.

Our research makes several key contributions. We developed a unique dataset capturing corporate disaster responses, created an annotation framework to classify communication styles, and provided insights into how businesses across sectors handle crises. Preliminary findings indicate that transformational posts, which focus on emotional connections, tend to generate higher engagement rates than purely informational content. By highlighting effective practices, this study offers valuable guidance for companies seeking to enhance their disaster communication strategies and strengthen their roles in supporting affected communities.

Corporate Social Responsibility (CSR) communication, particularly during crises, plays a significant role in shaping public perception and corporate reputation. Studies have shown that while CSR initiatives are critical in demonstrating corporate goodwill, the way they are communicated can greatly influence public response. Research by Cho and Hong (2009) indicates that readers tend to be more skeptical toward CSR activities, especially when they occur after a crisis, with more negative reactions directed at prominent corporations. Additionally, Cho, Furey, and Mohr (2016) highlight the importance of using interactive strategies on social media platforms to foster engagement. However, their findings reveal that most companies rely on one-way communication strategies, which may limit the potential for building trust. These studies collectively underscore the need for companies to adopt transparent, consistent, and engaging CSR communication strategies, particularly in the context of disaster relief. By applying lessons from these prior works, this study aims to analyze corporate disaster responses on Platform X, focusing on both informational and interactional communication styles.

Corporate social responsibility (CSR) communication has become a cornerstone for companies aiming to enhance their reputation and strengthen connections with stakeholders. Social media platforms, particularly X, offer organizations unique opportunities to engage with their audiences through dynamic and interactive communication. This section reviews two key studies: Araujo and Kollat (2018), who explored effective CSR communication strategies on Twitter, and Shi (2020), who examined how businesses use X to communicate disaster aid efforts.

Together, these studies highlight best practices and reveal areas where companies can improve their CSR communication.

The other prior research by Araujo and Kollat (2018) investigates how organizations communicate CSR efforts on Twitter, focusing on the effectiveness of engaging strategies and storytelling elements. They find that CSR messages incorporating emotional appeal and interactive features, such as questions or calls to action, were significantly more effective at driving user engagement likes or retweets. Furthermore, the study emphasizes the role of storytelling in creating a deeper emotional connection with audiences. For example, companies that shared inspiring narratives about their social impact initiatives were more likely to foster trust and loyalty among their followers. In addition to storytelling, they highlight the importance of two-way communication, organizations that actively responded to user comments or engaged in dialogue demonstrate higher levels of audience engagement and stronger brand relationships. The authors argue that companies using X to create a sense of community and shared purpose could enhance the perceived authenticity of their CSR efforts.

Shi (2020) expands the understanding of CSR communication by focusing on how companies communicate their disaster aid efforts on X. The study analyzes 129 tweets from 41 companies and identifies five primary types of corporate disaster aid: corporate giving, technical support, employee involvement, third-party collaborations, and information delivery. Corporate giving, such as donations or direct financial support, was the most common form of aid communicated by companies. Shi (2020) also highlights the impact of multimedia content, such as images and videos, on audience engagement. Tweets containing visuals are more likely to generate likes and shares compared to text-only tweets. For instance, companies that post their disaster relief efforts through videos or photos of aid distribution not only increase visibility but also enhance the emotional resonance of their messages.

The insights from Araujo and Kollat (2018) and Shi (2020) provide a valuable framework for this research. By applying the principles of effective storytelling, emotional appeal, and audience engagement, this study aims to analyze corporate social media posts related to disaster aid. Additionally, the research seeks to identify how companies can balance information delivery with interactive features to maximize stakeholder trust and involvement during crises.

A crucial component of contemporary business strategies, corporate social responsibility (CSR) improves a company's brand and fortifies ties with stakeholders. Social media's growth has given businesses previously unheard-of chances to inform the public about their CSR initiatives. Real-time communication, more openness, and the possibility of developing closer ties with stakeholders are all made possible by platforms such as Twitter (Chung & Lee, 2017). Studies

have shown that CSR communication on social media still has low levels of involvement, despite this potential (Etter, 2013). The ability of CSR communications to establish real connections and trust is hampered by this lack of involvement.

The lack of specific CSR accounts and a reactive communication style were the two main causes of the poor interactivity of CSR-related tweets, according to Etter (2013). Compared to non-CSR tweets (38.3%), CSR-related tweets are typically less participatory (18%), mainly because businesses are reluctant to talk candidly with stakeholders for fear of damaging their reputation. However, it has been demonstrated that specialized CSR accounts that allocate resources and concentrate on CSR-specific material achieve higher levels of involvement (23.57%). These results show that CSR communication needs to be more proactive, especially when it comes to using social media's interactive capabilities.

Additionally, visual content is essential for increasing the impact of CSR messaging. The emotional valence (positive vs. negative) and arousal (calm vs. stimulating) of pictures have a substantial impact on how the public views CSR reasons, sentiments toward businesses, and behavioral intentions (Chung and Lee, 2017). Compared to pleasant visuals, arousing negative visuals—like pictures of crises—elicit increased engagement and stronger attributions of public-serving motives. This emphasizes how crucial emotional design is to CSR communication since it can strengthen public relationships and increase perceived authenticity.

This study looks at the function of corporate social responsibility (CSR) communication on Twitter during the 2023 Kahramanmaraş earthquake, emphasizing how businesses engaged their audiences by striking a balance between emotional design and engagement. Our goal is to determine the best practices for CSR communication in catastrophe situations by examining company tweets and visual assets. The results add to the body of knowledge on corporate social responsibility communication by providing practical advice on how to strategically employ interactive elements and emotive imagery to increase public trust and involvement.

The following sections will describe the methods used for data collection and annotation, present a comprehensive analysis of the results, and discuss the broader implications for disaster relief logistics and corporate communication. Additionally, we outline potential areas for future research to deepen our understanding of corporate engagement in disaster scenarios.

2 Methodology

This section outlines the methods employed to collect, annotate, and analyze data for understanding corporate communication strategies during the disaster relief phase of the 2023 Kahramanmaraş earthquake. Given the critical role of social media in facilitating real-time information exchange and engagement, we focused on posts shared by local and international businesses on Platform X. The methodology is divided into three key components: data collection, annotation, and analysis.

2.1 Data Collection

The data collection phase for our project focused on gathering X posts from a selected sample of 60 local and international companies spanning various industries. These companies were selected for their significant presence and influence in both the Turkish and global markets. The primary aim was to capture brand communication and public interactions during the critical period following the Kahramanmaraş earthquake in Turkey. This section outlines the methods and tools employed to compile the dataset, ensuring comprehensive coverage and reliability.

The data collection period spanned from the beginning of February 2023 to the end of March 2023. This timeframe was chosen to focus on communication dynamics during and shortly after the immediate aftermath of the earthquake. To collect the data, we used the Selenium Twitter Scraper, a publicly available tool from GitHub (GitHub Link). Queries were executed to extract original posts from each company's account within the specified date range. An example query is shown below:

python scraper --query="(from:@cocacola_tr) until:2023-02-02 since:2023-02-01"

Data was then saved as CSV files and manually verified for accuracy.

The 60 companies included in this study span a diverse range of industries. These companies are categorized as follows:

- **Consumer Goods**: Gillette, L'Oréal, Orkid, Pınar, Eti, Flormar, Bosch
- **Food and Beverage**: Coca-Cola, Pepsi, Algida-Walls, Burger King, KFC, McDonald's
- **Automotive**: Toyota, BMW, Hyundai, Mercedes, Subaru, SEAT, Citroën, Volkswagen, Fiat, Ford Otosan
- **Technology**: Microsoft, HP, Huawei, Samsung, Sony, Teknosa

- **Retail**: H&M, Levi's, Marks and Spencer, Watsons, Carrefour, Yves Rocher, LC Waikiki, Vakko
- **Finance**: Allianz, Axa, HSBC, Garanti BBVA, Akbank, Yapı Kredi, İş Bankası, Halkbank
- **Logistics**: UPS, DHL
- **Telecommunications**: Vodafone, Türk Telekom
- **Household Appliances**: Arçelik, Vestel, Siemens, Koçtaş
- **Supermarkets**: BIM, Migros, Şok Marketler
- **Entertainmen**t: Netflix

The data collection process resulted in a robust dataset comprising thousands of tweets, capturing both brand-initiated and public communication during the earthquake period. This dataset is the foundation for subsequent content annotation and analysis tasks in this project.

2.2 Data Annotation

Data annotation is critical since the results mostly rely on annotated data. In that manner, four people conducted all annotation steps manually to assign appropriate labels for each tweet. In this way, reliable results were aimed. The four columns were added named "brand_post_type", "disaster_aid_action", and "relief_effect_type" to our dataset after tweets were obtained from data collection.

Brand post types are a broad label for a brand post and the categories are tagged based on categories including Informational, Transformational, and Interactional they are labeled as "1", "2", and "3" respectively. Informational tweets reflect factual, useful, or educational content and aim to inform consumers about the brand's products, services, or industry-related knowledge. In informational posts, the objective is to increase customer knowledge, awareness, and trust by providing valuable information that addresses consumer needs. The next tag was Transformational, which was tweeted to change consumers' perceptions of the brand by emphasizing the development of an emotional bond with the audience. These pieces strongly emphasize storytelling, emotive appeals, and connecting the brand to more general ideals, ways of life, or goals. Transformational postings seek to arouse emotions that connect with the viewer more deeply than practical information. The last brand post type, Interactional Posts, aims to build communication between the brand and the audience through questions, polls, or call-to-action prompts. These communications include replies through comments, likes, or shares.

The disaster aid action label is narrower and is given in the range between zero and seven. The main focus of this classification is to understand which type of action the brand takes during

the specified disaster period. Zero indicates “None” that content is not related to disaster aid, one indicates “sympathy” meaning that the message is shared to grief the society, two is “Corporate Giving” meaning donations of goods are made, three indicates “Employee Involvement” covers the use of employees as a volunteer, four indicates “Technical Support” which mean brand provides equipment, or infrastructure, five means “Third Party Involvement” that indicates brands collaborates with organizations, six means “Information Delivery” which indicates that brands provide information to the public, and the label seven indicates “Other” disaster actions that brands made.

The relief effect type shows the length of the aid, which is short-term or long-term. While 1 represents long-term aid, 2 indicates that the aid is short-term, and 0 states that no aid exists for the tweet posted by a brand.

After obtaining the annotated data, a column named “agreement_count” was added, which recorded the most frequently assigned label for each post. In cases where the count was tied (two annotators agreeing on one label and the other two on another), all four annotators reviewed the post together to reach a consensus. The final agreed-upon label was recorded in a separate column named “consensus_label” to ensure more reliable results.

To further validate the reliability of the annotation process, we conducted a user reliability test using Krippendorff’s alpha, a statistical measure for inter-annotator agreement. The results indicated high levels of consistency across annotators, with the following values:

- Disaster Aid Action Type: 0.750
- Relief Effect Type: 0.768
- Brand Post Type: 0.794

Since all values exceeded the commonly accepted threshold of 0.7, the results demonstrate that the manual annotation process was consistent and dependable. This high level of agreement confirms the robustness of the dataset, ensuring a strong foundation for subsequent analysis.

2.3 Data Analysis

The analysis revealed significant corporate social media communication trends during the disaster period, highlighting variations in media usage, engagement patterns, and the effectiveness of post types. By examining thousands of posts shared by local and international businesses, we aimed to uncover how different communication strategies influenced public engagement and

brand perception. This section provides a comprehensive breakdown of the results based on the annotated labels—brand post type, disaster aid action, and relief effect type—and explores key insights into the role of corporate social responsibility (CSR) communication during crises. Statistical methods were applied to identify correlations, while data visualization techniques were used to present trends across industries.

Upon conducting a frequency analysis, it became apparent that international companies posted significantly more than local ones across all phases, with the highest activity occurring before and during the early recovery stages. In terms of post types, the majority were informational (3978 posts), while transformational (601 posts) and interactional (41 posts) posts were less common. Regarding disaster aid actions, most posts (4165) were unrelated to aid, with corporate giving (275 posts) being the most frequently observed aid-related action. Lastly, short-term aid (386 posts) was more prevalent than long-term aid (29 posts), indicating a stronger emphasis on immediate relief over sustained support. The data was then divided into four distinct periods based on specific dates Before (before February 6, 2023), During (February 6 to February 14, 2023), Emergency Relief (February 14 to February 28, 2023), and Early Recovery (after February 28, 2023) to analyze the progression of communication strategies over time.

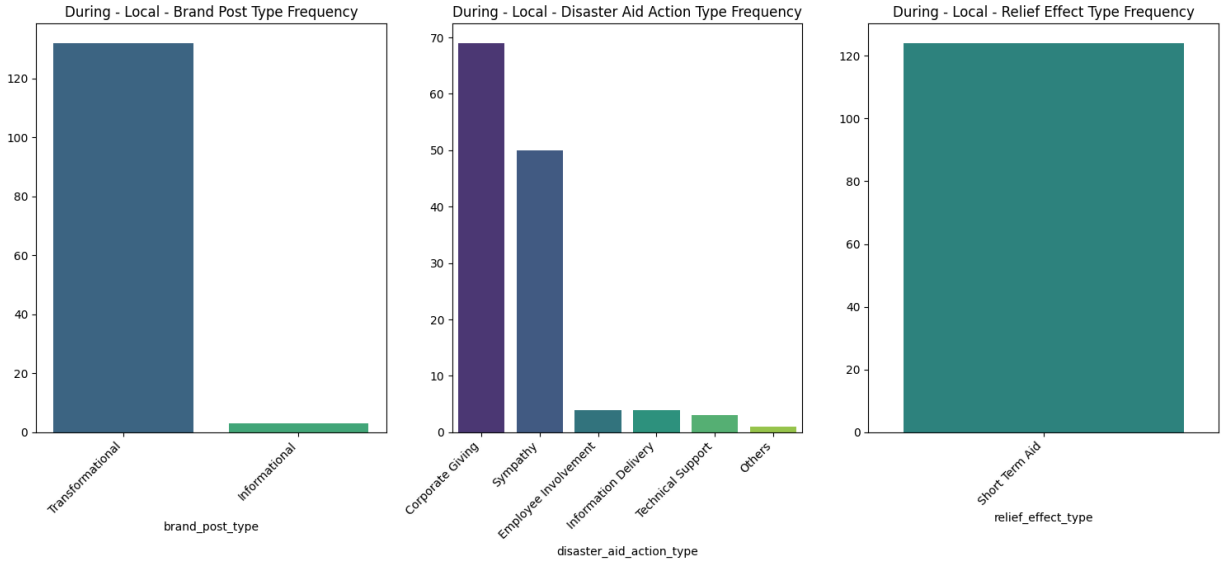

Figure 1: Local Companies – Earthquake Period Analysis

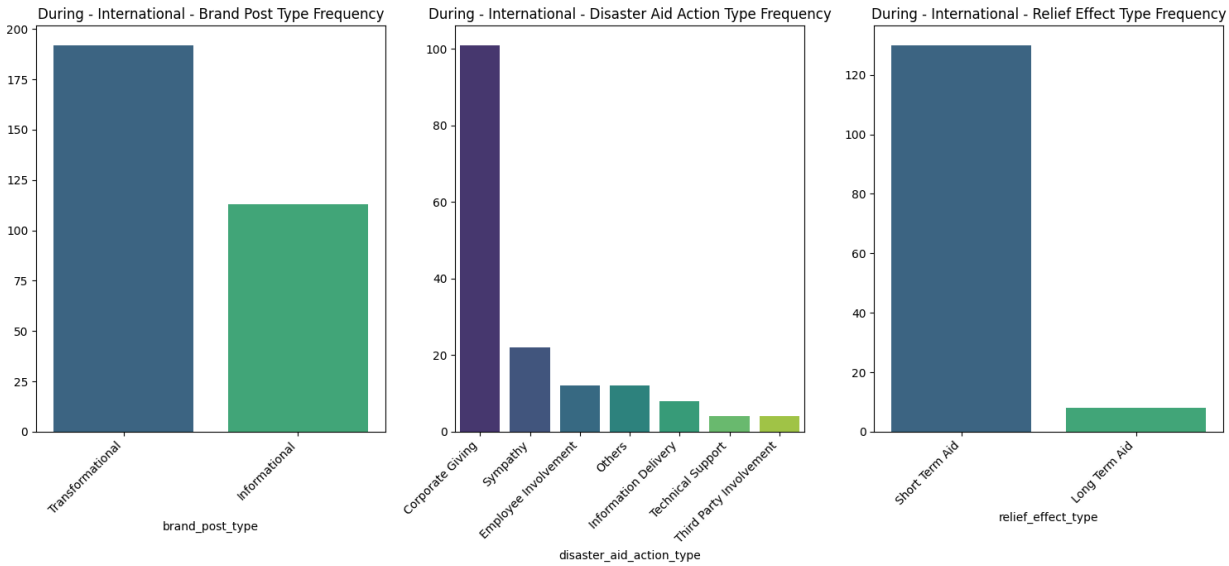

Figure 2: International Companies – Earthquake Period Analysis

During the disaster period, local companies (Figure 1) primarily focused on transformational posts, emphasizing emotional engagement. The most common disaster aid actions were corporate giving and sympathy, with all relief efforts classified as short-term aid. This suggests that local companies were more actively involved in providing immediate assistance and fostering emotional solidarity with the affected community. In contrast, international companies (Figure 2) showed a more balanced use of transformational and informational posts, indicating a dual approach of emotional connection and information dissemination. While corporate giving and sympathy were also prevalent, international firms demonstrated a wider range of aid actions, including employee involvement and technical support, but with less direct engagement compared to local companies.

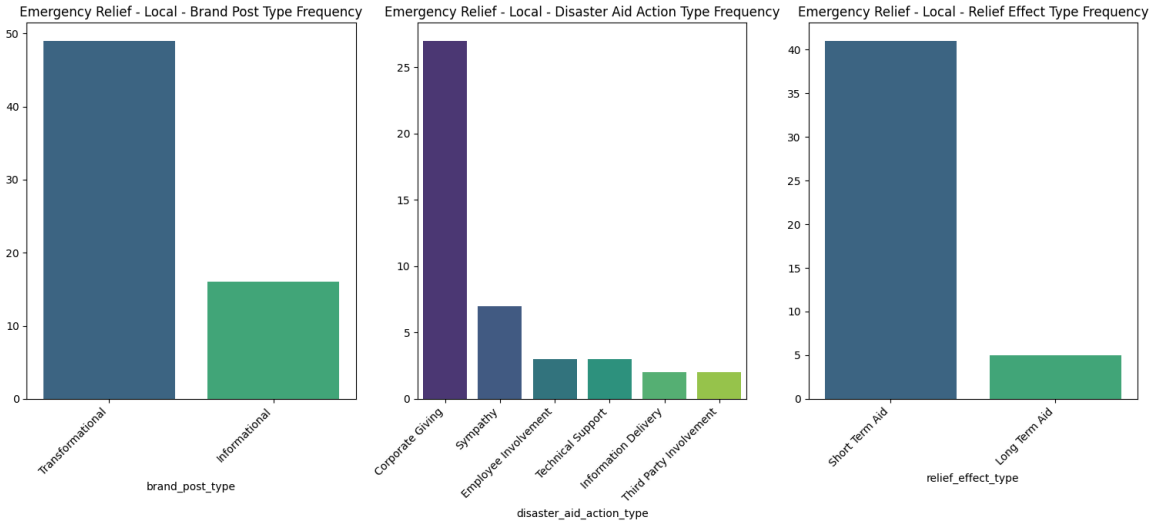

Figure 3: Local Companies – Emergency Relief Period Analysis

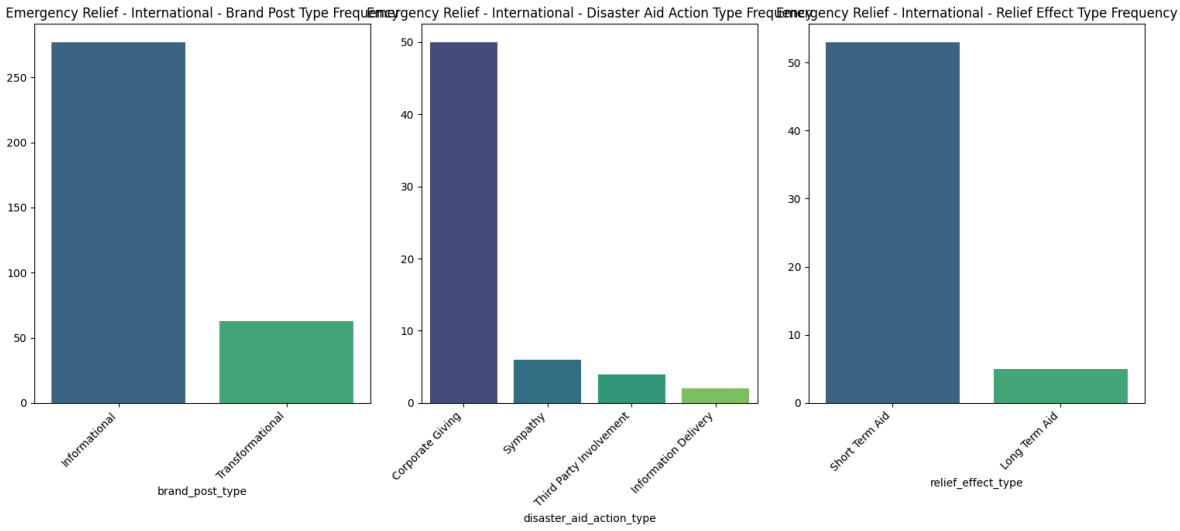

Figure 4: International Companies – Emergency Relief Period Analysis

During the emergency relief phase, local companies (Figure 3) increased informational posts, shifting away from the earthquake while still focusing on transformational posts and direct involvement through corporate giving and employee involvement. This indicates that although local businesses continued to play an active role in relief efforts, they posted less about the earthquake itself, suggesting a gradual move toward broader business communications and less sustained focus on the disaster. In contrast, international companies (Figure 4) saw a sharp drop in transformational posts, decreasing by half compared to the earlier disaster period, while informational posts became more and more prominent. This suggests a decline in emotional engagement and sustained attention from international companies during this phase. Despite this, international firms continued to emphasize corporate giving and short-term aid, with some posts highlighting long-term support.

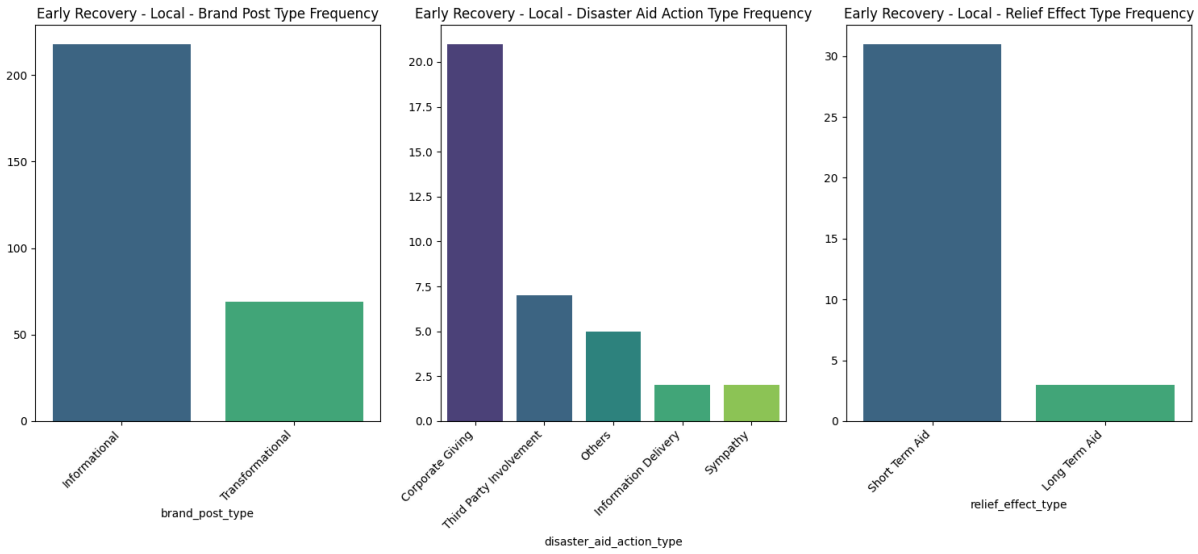

Figure 5: Local Companies – Early Recovery Period Analysis

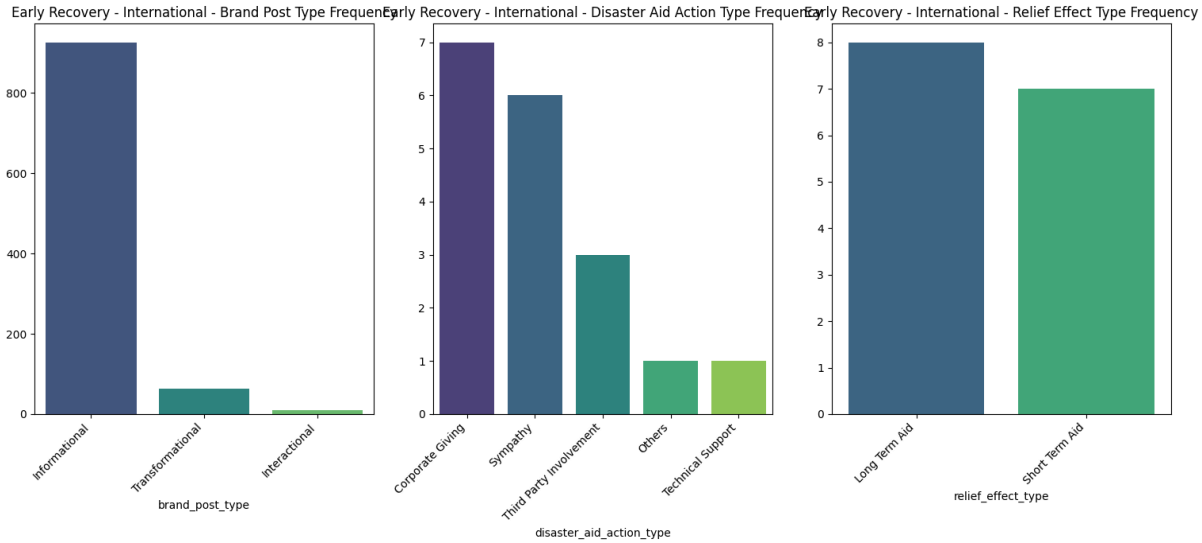

Figure 6: International Companies – Early Recovery Period Analysis

During the early recovery period, local companies (Figure 5) increased informational posts while reducing transformational posts, signaling a gradual shift from earthquake-focused content to broader business communications. Despite this, corporate giving and third-party collaborations remained key, indicating continued involvement in relief efforts. However, the overall emphasis on the disaster decreased as businesses began transitioning back to routine operations. In contrast, international companies (Figure 6) saw a significant drop in transformational posts, with informational content becoming dominant. Many of these posts were marketing-focused, reflecting reduced emotional engagement. Despite this decline, international

brands continued to emphasize corporate giving and short-term aid, with occasional mentions of long-term support.

Overall, both local and international companies reduced their online presence during this phase. Local brands focused on practical updates, while international brands shifted toward informational and marketing posts, signaling a waning focus on the earthquake and a return to regular communications.

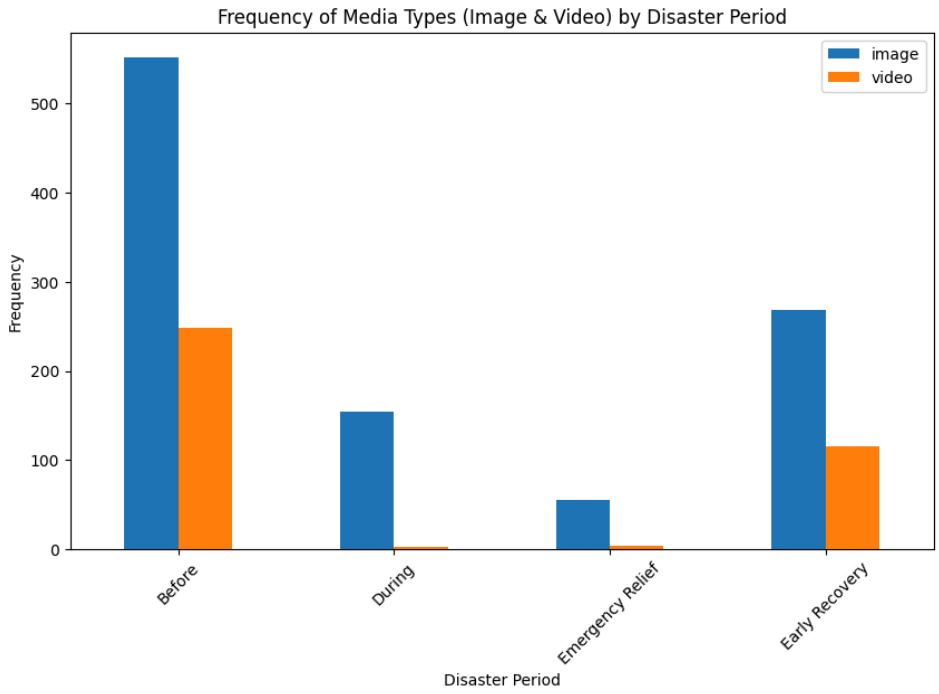

Figure 7: Frequency of Media Types by Disaster Period

Visual content played a critical role throughout all disaster phases, with images being the most frequently used media type across all periods, as shown in Figure 7. Video usage was less prominent, with a steep decline observed during the immediate disaster phase. This indicates that while images were favored for conveying information quickly and effectively, videos may have been limited by time constraints in crises.

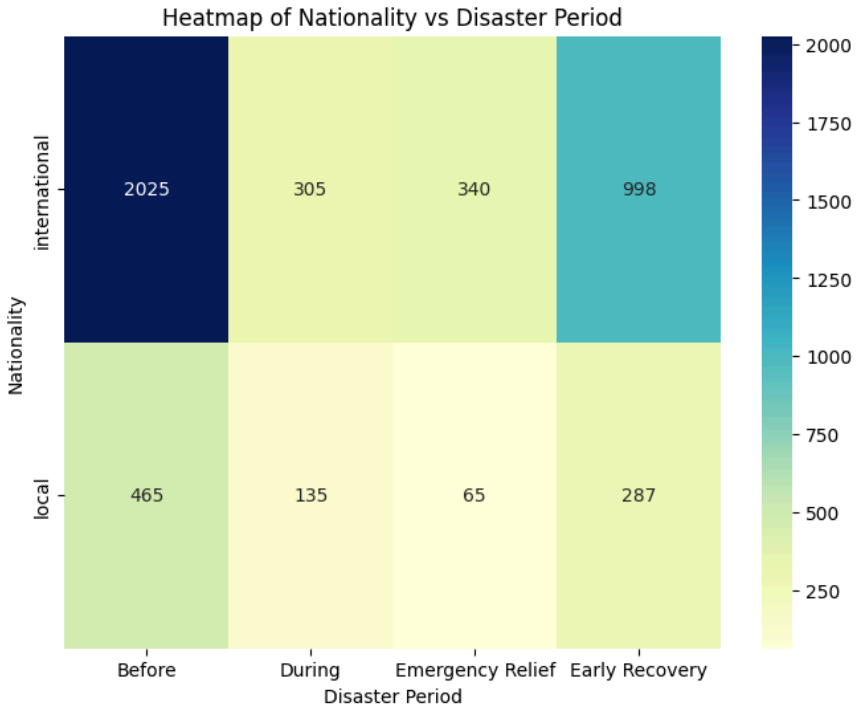

Figure 8: Heatmap of Nationality vs Disaster

Nationality also influenced communication strategies, as shown in Figure 8. International companies were more active before the disaster, contributing 2025 tweets compared to 465 from local companies. However, local companies maintained more consistent activity during the disaster and post-disaster phases, reflecting their proximity to and engagement with affected communities.

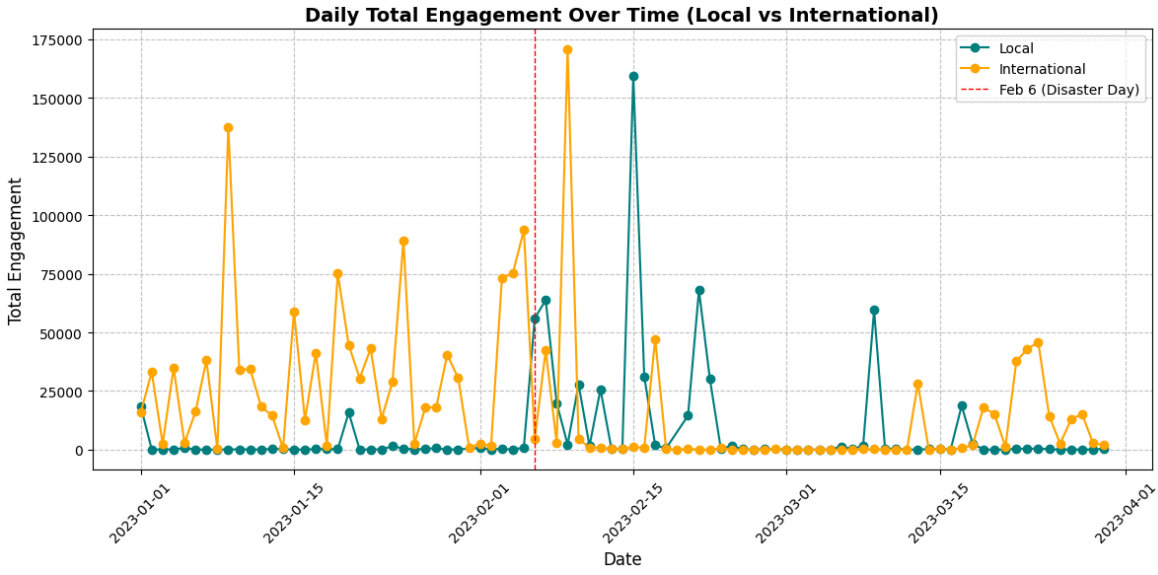

Figure 9: Daily Total Engagement Over Time (Local vs International)

Engagement trends over time as Figure 9 demonstrated that international companies achieved higher peaks in total engagement, particularly immediately after the disaster day (February 6). Local companies, by contrast, maintained steadier engagement levels, emphasizing their community-oriented messaging and sustained presence throughout the crisis.

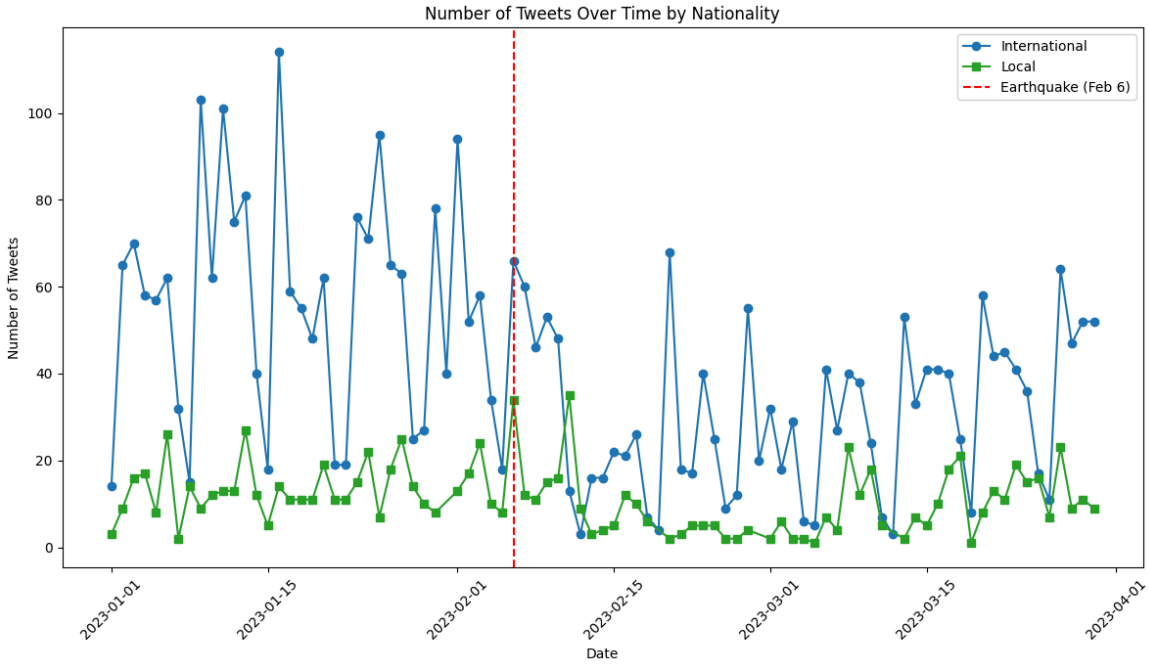

Figure 10:Number of Total Tweets Over Time by Nationality

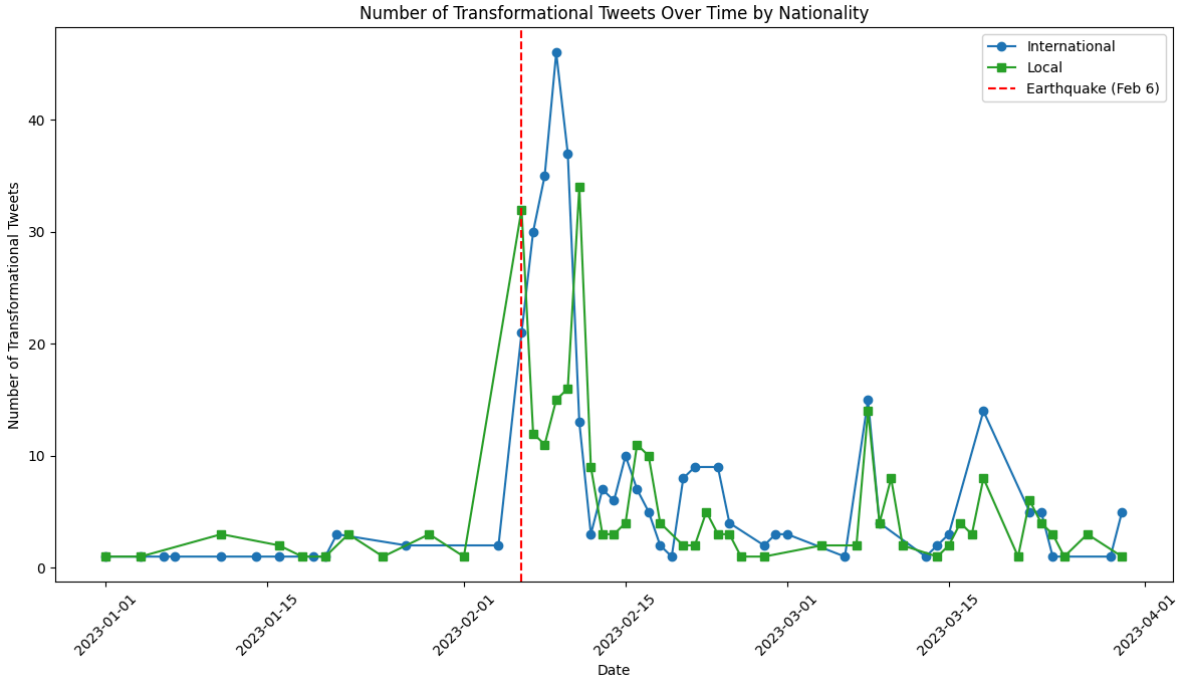

Figure 11: Number of Transformational Tweets Over Time by Nationality

According to Figure 10, international companies consistently posted more tweets than local ones across all phases. Both groups increased activity immediately after the earthquake, but international companies maintained higher tweet volumes throughout the early recovery phase, whereas local companies reduced their activity significantly over time. Figure 11 shows that transformational posts surged after the earthquake, with local companies posting slightly more than international ones. These posts, focused on emotional engagement, gradually declined during the early recovery period. Local companies sustained a relatively higher level of transformational communication, while international companies shifted back to informational and marketing content. Despite their higher total tweet volume, international companies placed less emphasis on transformational posts, prioritizing informational content. In contrast, local companies, while posting fewer tweets overall, prioritized emotional engagement, reflecting a more community-centered approach.

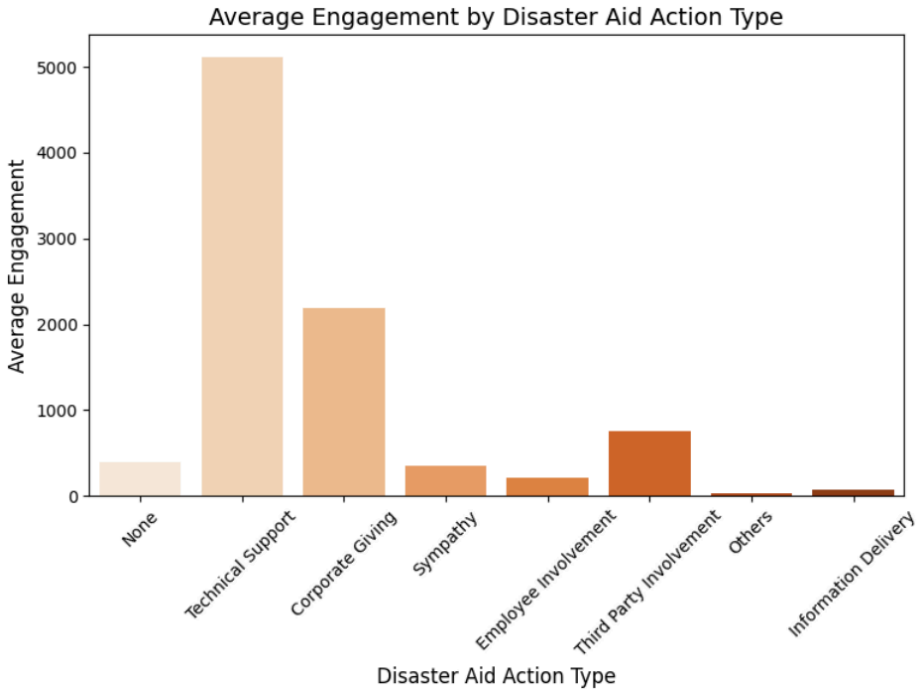

Figure 12: Average Engagement by Disaster Aid Action Type

The figure 12 highlights the engagement trends across various types of disaster aid actions communicated by companies. Among the categories, Technical Support achieved the highest average engagement, reflecting the public's preference for action-oriented and impactful contributions during crises. Corporate Giving, involving financial or material donations, followed closely in engagement. In contrast, Sympathy and Employee Involvement generated lower engagement, suggesting that emotional or volunteer-focused posts are less impactful than direct

aid actions. Information Delivery and Others received the least engagement, emphasizing the limited resonance of purely informational or miscellaneous posts with the audience. This analysis underscores the importance of tangible and actionable communication strategies in maximizing public interest and interaction during disaster relief efforts.

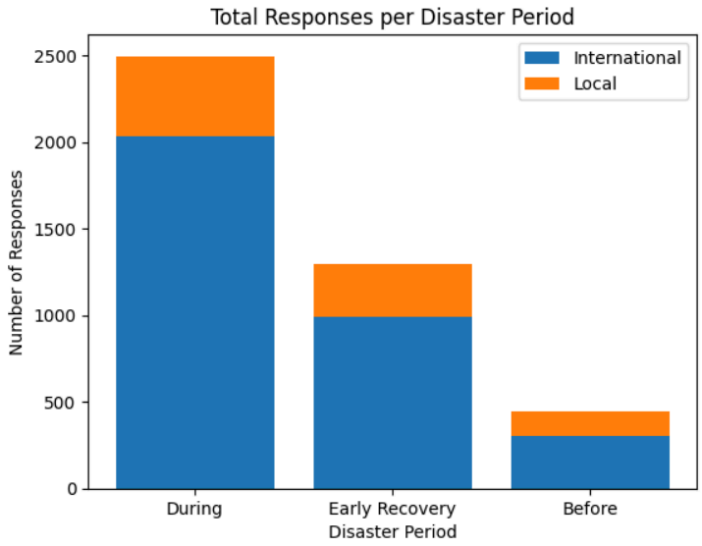

Figure 13: Total Responses per Disaster Period

The total replies from both domestic and foreign businesses throughout disaster periods are displayed in Figure 13. The peak activity occurred during this time, when foreign businesses predominated and local businesses made a little contribution. While reactions were limited during the Before period, activity declined throughout the Early Recovery phase but remained significant. This demonstrates how urgent relief efforts are prioritized, particularly by multinational corporations.

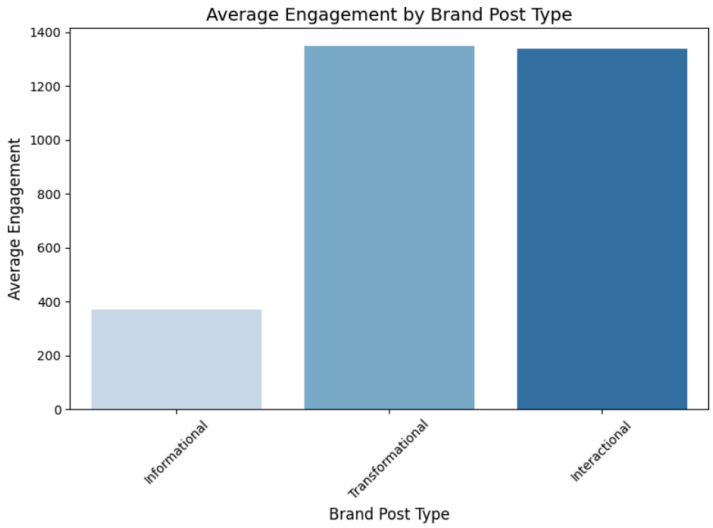

Figure 14: Average Engagement by Brand Post Type

Figure 14 displays the average engagement levels for different brand post types. Transformational and Interactional posts show the highest engagement, both exceeding 1,200, while Informational posts lag significantly, averaging below 500. This indicates that posts fostering emotional connections or encouraging audience interaction are far more effective at driving engagement compared to purely factual content.

3 Discussion and Conclusion

Social media plays a crucial part in business disaster relief communication, according to this study, which also emphasizes how it may improve public engagement and aid humanitarian operations. The significance of empathy and storytelling in crisis communication was demonstrated by our analysis of tweets from domestic and foreign businesses following the 2023 Kahramanmaraş earthquake. We discovered that transformational postings, which focused on emotional resonance, received the maximum interaction. Images in particular have become an essential instrument for swiftly and successfully communicating ideas. While foreign corporations reached greater heights through large-scale initiatives like corporate philanthropy, local companies consistently engaged through messages that centered on the community. These results advance our knowledge of successful corporate social responsibility (CSR) communication tactics in times of crisis, providing practical advice on how businesses should strike a balance between informational and emotional content to increase impact and trust. In order to further enhance the coordination of relief operations, future research might build on these findings by investigating more crisis situations and utilizing cutting-edge machine learning techniques like topic modeling and named entity identification. This study highlights how social media may revolutionize disaster relief logistics by strengthening community ties and overcoming supply and demand gaps.

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