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Investigating Publics' Communicative Action in Problem Solving (CAPS) Through Data Science

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Abstract

This study examined the communicative action in problem solving model through data science-driven approaches to enhance the understanding of online publics' communication behaviors. Using ChatGPT, the study analyzed YouTube comments from news channels that covered a contentious entertainment issue with multiple related events. The findings indicated that communication behaviors changed over time and manifested in diverse combinations. In addition, the study demonstrated that aware publics in the digital era were not merely passive; rather, they engaged in communication activities similar to active publics. Furthermore, it identified distinct communication behaviors associated with certain types of publics, indicating that public types also evolve dynamically across events. The results suggested that the communicative action in problem solving model served as a valuable framework for examining online communication behaviors in the digital era. Based on these insights, this study offered both academic and practical contributions to the field.

Keywords

communicative action in problem solving; online communication; online communication behaviors; public types; strategic communication

1. Introduction

Over the past decade, researchers have employed data science-driven approaches increasingly to analyze large datasets in communication studies (Bolsover & Howard, 2019; boyd & Crawford, 2012; Chang et al., 2023; Chen et al., 2020; Choi, 2020; Freelon et al., 2016; Howard et al., 2011; Murthy, 2017). In this process, computer-assisted methods have been used to explore various communication theories, including agenda-setting theory (Guo & Vargo, 2015; Neuman et al., 2014; Vargo & Guo, 2017), cultivation theory (Song et al., 2023), attribution theory (Park et al., 2022), organization–public relationships (H. L. Lee, 2023), and the computer-mediated communication competence forecasting model (Chih-Ming & Ying-You, 2020). This approach is valuable, as it provides meaningful insights into reality through empirical observations grounded in theory (E. W. Lee & Yee, 2020; Helles & Ørmen, 2020), highlights theories' continued importance (Gil de Zuniga & Diehl, 2017; Mahrt & Scharkow, 2013; Parks, 2014), and contributes to their development (Wise & Shaffer, 2015). Accordingly, scholars have suggested that it would be valuable to integrate such theoretical frameworks as the two-step flow model, the theory of normative social behavior, and the communal coping theory further into data-driven communication research (Rains, 2020).

Consistent with this trend, this study examines a theoretical framework in public relations using a data-driven analytical approach. Researchers have highlighted that public relations professionals should expand their knowledge of emerging technologies (Kent & Saffer, 2014) and acknowledge the role that advanced data analytics play in enhancing public relations research, particularly in areas such as audience targeting, landscape analysis, and evaluations (Holtzhausen & Zerfass, 2015; J. E. Grunig, 2023; Weiner & Kochhar, 2016). However, as Wiesenberg et al. (2017) noted, the application of technical skills to large-scale data analysis remains underdeveloped in this field, which finds public relations scholars "lagging behind" (p. 26). To bridge this gap, this study uses a computational approach to apply public relations theory, with a specific focus on the communicative action in problem solving (CAPS) model. This model provides not only a way to investigate publics' online communication behaviors, but also offers a structured framework with which to identify public types based on these behaviors (Ni & Kim, 2009). By integrating data science, this study attempts to provide a fresh perspective on the CAPS model and presents valuable prospects for strategic communication.

Despite the CAPS framework's wide-ranging application in various studies (Chon & Harrell, 2024; Chon & Park, 2021; Krishna, 2018; Roh & Oh, 2021), the understanding of public communication behaviors that this model offers has yet to be explored fully. Based upon Dewey's (1927/1954) argument, CAPS conceptualizes the public as problem solvers (J.-N. Kim & Krishna, 2014) who respond differently to issues or problems (Ni & Kim, 2009) depending upon the context in which they are situated (J. E. Grunig & Kim, 2017). As situational conditions evolve continuously, CAPS posits that public reactions to issues or problems also change over time (Grunig, 1978; J.-N. Kim & Grunig, 2011). In addition, these reactions can manifest as both passive and active communication behaviors, and in some cases, both types may coexist simultaneously (Grunig, 1989; Krishna, 2018). Further, CAPS explains that there are representations of communication traits associated with each public type (Chon et al., 2023; J. E. Grunig & Kim, 2017), indicating that the publics' status is shifting dynamically in response to the evolution of communication behavior (Dozier & Ehling, 2013). However, traditional methods, such as web-based surveys, which have been used predominantly in previous CAPS studies, face limitations in examining these aspects. This is because each communication behavior has traditionally been analyzed as a separate variable at a single point in time, whereas

studying the evolution of various communication behaviors and public statuses simultaneously requires long-term observation.

Computation tools allow data to be gathered at different times (Parks, 2014). Thus, the dynamics of communication behaviors, their coexistence, and the evolving nature of public status over time can be investigated effectively using new technology research. In this respect, this study starts introducing the CAPS framework to explain different types of communication behaviors and discusses in detail the limitations of traditional research methods in CAPS studies. Subsequently, it employs a data science-driven approach to examine the online communication behaviors related to a continuous issue, the changes in these behaviors over time in response to key events within the issue, the diverse combinations of behaviors, the status of the publics who generate these behaviors, and the correlation between specific communication behaviors and public status.

The context of this study focuses on an issue within the entertainment industry, a field recognized widely as one of the most prominent arenas engaged with multiple societal issues (Elberse, 2013) and one that has long been intertwined closely with public relations, as P. T. Barnum exemplified (Tilson, 2016). It is anticipated that this new approach will help understand better not only the transitions and combinations of different communication behaviors but also the dynamics of public types associated with each communication behavior within the CAPS framework. Further, it is anticipated that this approach will provide public relations practitioners with insights into the way that data-driven methodologies can enhance the understanding of online communication behaviors and help implement more detailed communication strategies to address issues or problems.

2. Literature Review

2.1. CAPS

The situational theory of problem-solving, an extension of one of the most widely recognized public relations theories—the situational theory of publics (J.-N. Kim & Krishna, 2014), offers valuable insights into the activeness of communication on the part of various types of publics. This framework is structured around three key dependent variables that represent fundamental communication behaviors: information acquisition, information selection, and information transmission. Collectively, these behaviors constitute CAPS, which serves as the primary theoretical foundation for this study.

CAPS has been found to be effective in understanding the public's active communication behavior in contexts such as climate change (Bhalla, 2022), public health crises (Chon & Park, 2021; Krishna, 2018), corporate social responsibility campaigns (Roh & Oh, 2021), and racial activism (Chon & Harrell, 2024). These studies demonstrate that the three behaviors enhance our understanding of public communication behaviors further.

2.1.1. Information Acquisition

Information acquisition is a communication behavior that pertains to the different degrees of searching for information to solve problems. It varies between proactive and reactive communicators. Proactive communicants engage in deliberate information seeking, a purposeful and systematic approach to acquiring

information to address specific problems or uncertainties. This behavior reflects a strategic effort to mitigate potential issues by gathering relevant data and insights actively before they become pressing concerns. Conversely, reactive communicants exhibit information attending, where they gather information incidentally rather than through an intentional search. These individuals may encounter information in their daily interactions or through accidental exposure. This reactive approach to information acquisition highlights a more passive stance, where the acquisition of information is secondary to immediate, unplanned circumstances (J.-N. Kim & Grunig, 2011).

2.1.2. Information Selection

The process of selecting information involves the way that individuals direct their focus in collecting and choosing information about an issue. Proactive communicants engage in information forefending, where they use a selective approach to manage information by applying an "only if" rule and weighing "relevance" as the criterion for whether to approach or ignore information about the problem. In contrast, reactive communicants practice information permitting, characterized by accepting and considering whatever information becomes available. This approach involves a more open attitude toward incoming information that allows them to process and incorporate a broader range of data into their understanding of the issue at hand (J.-N. Kim & Grunig, 2011; J.-N. Kim & Krishna, 2014).

2.1.3. Information Transmission

Information transmission pertains to how individuals disseminate information about an issue to others. Proactive communicants demonstrate information forwarding, a communication behavior where they share information in a positive manner, even in the absence of specific requests. This behavior reflects a proactive stance on disseminating information, where individuals take the initiative to spread knowledge and insights that potentially influence others' understanding and responses to issues. On the other hand, reactive communicants engage in information sharing and provide information only in response to direct requests. This behavior highlights a more passive approach, where the dissemination of information is contingent upon external prompts rather than self-initiated efforts. Such a distinction underscores the varying degrees of initiative and responsiveness in the way that individuals contribute to the communication process (Chon et al., 2023; J.-N. Kim & Grunig, 2011).

Examining publics' online communication behaviors based on those various dimensions can help organizations determine where to focus their efforts strategically and how to prepare effectively in different situations.

3. Limitations of Previous Studies Using the CAPS Model

Prior studies that focused on CAPS relied on traditional research methods. Specifically, previous studies have explored CAPS through interviews (Ni & Kim, 2009), experiments (Y. Kim, 2016), and a combination of mailed and web-based surveys (Shen et al., 2019). Among these, web-based surveys were used most frequently (Chon & Park, 2021; Chon et al., 2022; H. J. Kim & Hong, 2021; J.-N. Kim, Shen, & Morgan, 2011; Xu et al., 2021). Although these studies offered valuable implications, they also had several limitations.

First, the research methods employed in previous CAPS studies capture communication behaviors at a single point in time. While some studies have investigated all six dimensions (Chon et al., 2022; J.-N. Kim, Shen, & Morgan, 2011; Xu et al., 2021), others have focused on only three (H. J. Kim & Hong, 2021; Krishna, 2018) or just two (Chon & Park, 2021; J.-N. Kim & Lee, 2014). Regardless of the specific focus of CAPS research, each communication behavior has been observed within a cross-sectional framework. However, CAPS, which builds on Dewey's situational view of publics, acknowledges that certain publics are more situational (Ni & Kim, 2009), which means that their communication behaviors are not static, but instead, fluctuate over time in response to changing environmental conditions. Recognizing this characteristic, researchers can examine further the way that online communication behaviors adapt as conditions evolve.

Second, previous research has not only analyzed communication behaviors at a single point in time but has also examined each dimension individually as a dependent variable. However, in reality, communication is inherently multifaceted and often involves a combination of various communication behaviors. For example, a comment on a news report that states, "Oh my! I can't believe something like this happened! Can anyone tell me what happened next?" reflects both passive (information attending) and active (information seeking) information acquisition. Similarly, a statement like, "Any updates on this issue? If you're new and want to catch up on what has happened so far, feel free to visit my blog," combines active information acquisition (information seeking) with active information transmission (information forwarding). It is expected that researchers will be able to more effectively capture the combination of these behaviors in digital environments by adopting a new research approach.

Third, previous CAPS studies have focused primarily on publics' communication behavior. However, according to J. E. Grunig (1989), public segmentation can also be explored through communication behavior. He explained that publics can be categorized into four segments based upon the level of activeness (J. E. Grunig, 2013): nonpublics, latent publics, aware publics, and active publics. Traditionally, these types are determined by situational recognition of an issue or problem and are assessed through three key factors: problem recognition (is it a problem?), involvement recognition (is it your problem?), and constraint recognition (can you do something to solve this problem?; J. E. Grunig, 1997). Here, nonpublics are individuals who are unaware of any problems, while latent publics are involved in a problem but do not perceive it as problematic. Aware publics acknowledge both the problem and its implications, while active publics not only recognize the problem but also take action to address it. In essence, greater problem recognition and involvement recognition, coupled with lower constraint recognition, lead to greater public activeness. However, given that CAPS encompasses both active and passive dimensions, research can also investigate public segmentation further through this publics', which will provide a deeper understanding of the typical communication behaviors associated with each public type (J. E. Grunig & Kim, 2017).

This study proposes analyzing the CAPS framework using data science-driven approaches to address these limitations and expand the investigation of the CAPS model. This method makes it possible to overcome challenges related to the static timeframe, the isolated analysis of communication behaviors, and the previous inability to explore the connection between communication behavior and public types.

4. New Data Science-Driven Approaches in CAPS Studies

This study uses data science-driven approaches, including AI, to collect and analyze online communication behavior within the CAPS framework. This approach allows publics' online communication behaviors to be examined comprehensively, specifically: (a) how these behaviors evolve over time in response to key events; (b) the various ways that these behaviors combine; (c) the public types of those generating these behaviors; and (d) the association between specific communication behaviors and public types.

4.1. Exploring the Transformation of Online Communication Behavior

J.-N. Kim and J. E. Grunig (2011), who proposed the CAPS model, explained that it is based upon the assumption that most human behavior is motivated by the need to solve problems. Specifically, they described how communication behavior identifies solutions and applies them in two stages: the inquiring phase and the effectuation phase. The inquiring phase begins when individuals become motivated to solve a problem and seek information to identify and validate solutions. This phase is divided further into internal and external inquiring phases. The internal inquiring phase involves cognitive searches, where individuals rely on their prior knowledge and experiences. However, if they fail to activate relevant knowledge (J.-N. Kim & Grunig, 2011, p. 128) and continue to struggle to determine a course of action, they transition to the external inquiring phase, where they seek information from external sources. During these two inquiring phases, information acquisition behaviors become more pronounced. This includes information seeking, defined as scanning the environment deliberately to obtain information on a specific topic, and information attending, which refers to the unplanned discovery of information during the problem-solving process (J. E. Grunig, 1997).

On the other hand, sustained problem-solving efforts lead individuals to transition into the effectuating phases of problem-solving. The search process in this phase may be unfinished, but it evolves into a process of filtering out irrelevant data. As a result, information acquisition behaviors begin to fade, while information selection (i.e., information forefending and information permitting) and information transmission (i.e., information forwarding and information sharing) become more prominent. These behaviors can be performed individually or collectively, which leads to a further subdivision into the individual effectuating phase and the collective effectuating phase.

Figure 1 illustrates how problem solvers' information selectivity, transmission, and acquisition behaviors differ across these phases. Information acquisition increases gradually from the internal inquiring phase through the external inquiring phase and reaches its peak in the individual effectuating phase before it exhibits a sharp decline in the collective effectuating phase. In contrast, information selection and information transmission increase steadily across all three phases and reach their highest levels in the final collective effectuating phase.

These findings suggest that depending upon publics' situational motivation, predominant communication behaviors about an issue can shift over time. In this context, the following research question is presented:

> RQ1: Which specific communication behaviors within the CAPS framework are most prevalent in a contentious entertainment issue that encompasses multiple related events?

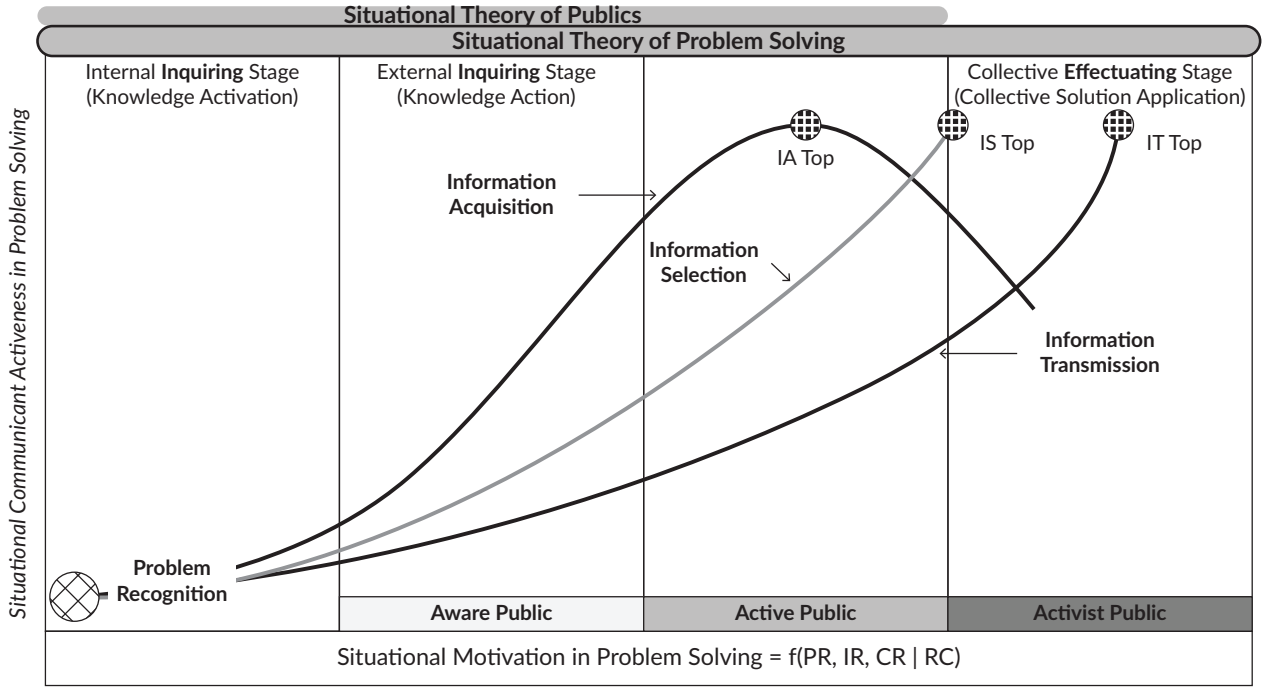

Figure 1. Sequential illustration of motivated information behavior in problematic situations. Source: J.-N. Kim (2006), Ni and Kim (2009). Notes: IA = information acquisition; IS = information selection; IT = information transmission.

4.2. Examining the Diverse Combinations of Online Communication Behaviors

J.-N. Kim and Krishna (2018) explained that the three main dimensions of CAPS—information selection, transmission, acquisition—often occur simultaneously, as they are not mutually exclusive. This simultaneity is also illustrated in Figure 1, while Y. Kim (2016) found that information attending (passive) plays a regulatory role in influencing other communicative behaviors.

However, beyond these established combinations, a broader spectrum of communication engagement may exist. For example, closed-minded individuals tend to seek out similar messages (Barnidge et al., 2020) and engage in spontaneous information-sharing behaviors (Hirsch, 2011). This suggests that three key communication behaviors can be identified among activists: information forefending (active), information seeking (active), and information sharing (passive). Therefore, this study suggests investigating the various combinations of communication behaviors that emerge and seeks to determine which combinations are observed online most commonly, particularly as they can be analyzed effectively using data science-driven approaches. In this context, the following research question is posed:

> RQ2: Are there specific combinations of communication behaviors within CAPS that are most commonly observed in an issue?

4.3. Confirming the Association Between Online Communication Behaviors and Public Status

Among various public types that J. E. Grunig (2013) introduced, most publics who engage in online communication can be categorized as active (high involvement and low constraint recognition) or activist

publics (high problem recognition, high involvement recognition, and low constraint recognition; J.-N. Kim & Grunig, 2011). This is the case because demonstrating communication behavior about specific issues online demonstrates at least some level of awareness, interest, or concern, which indicates a certain degree of recognition or involvement in the problem. In addition, online platforms facilitate not only the effortless expression of opinions, but also accessible participation in various forms of action—such as boycotts, union memberships, or demonstrations—which lower barriers to engaging with, and advocating for, an issue thereby. This suggests a relatively low level of constraint recognition.

In addition to active publics and activists, Baym's (1996) study identified the presence of aware publics online, characterized by individuals with low involvement in an issue (J. E. Grunig, 2013). Her research highlighted that computer-mediated communication employs a hybrid language that combines spoken and written discourse elements, as well as interpersonal and mass communication. This reflects that while online communication is primarily text-based, publics' interactive and transient nature renders the interaction similar to orality. Given that online communication exists along a written-oral continuum, Baym's (1996) study found that online interactions involve multiple participants, including publics who do not engage deeply and synchronously with an issue, but express interest in a message through subtle indications of intent or effort—a process that, in face-to-face conversations, would be conveyed typically through voice, gestures, or other nonverbal cues.

In summary, three distinct public types are expected to exhibit communication behaviors on online platforms. To investigate which types prevail in online discussions of an issue, this study poses the following research question:

> RQ3: Which public types are observed online most commonly during an issue?

On the other hand, active publics are more likely to become members of activist groups (J. E. Grunig, 1989). This suggests that public status is not fixed, but evolves continuously. Many researchers have acknowledged publics' dynamic nature. For instance, Nussbaum (2013) indicated that publics are formed and transformed through collective experiences and emotional engagement, while Dozier et al. (2013) and J. E. Grunig (1978) characterized them as fluid and evolving rather than static entities, as individuals engage in discussions, debates, and problem-solving. J. E. Grunig explained further that this continuous evolution occurs in response to shifting environmental conditions and emerging challenges. In this context, scholars such as Lünenborg (2019) and Paget (1929) have emphasized the importance of examining publics' dynamic nature. As a data science-driven approach enables progress to be tracked over time, this study seeks to analyze the transformation of public types throughout the discussion of an issue. This inquiry leads to the following research question:

> RQ4: How do public types evolve throughout a contentious entertainment issue that encompasses multiple related events?

4.4. The Association of CAPS and Public Types

Finally, this study attends to the fact that Figure 1 illustrates not only the transitions in a problem solver's different communication behaviors across various phases, but also demonstrates how each public type is

associated with specific communication behaviors. J.-N. Kim et al. (2010) noted that information acquisition, particularly information seeking, is unique to active problem solvers, as people look for information as they become more motivated to solve a problem (J. E. Grunig, 1997). In addition, active publics demonstrate moderate information transmission with a relatively high level of information selection and significant information acquisition (J.-N. Kim & Grunig, 2011). However, aware publics show low levels of information transmission and information selection, together with moderate information acquisition. On the other hand, activists are highly selective in the information with which they engage (information selection) and excel at sharing or disseminating that information to others (information transmission). Moreover, they often demonstrate confirmation bias and prioritize information that is consistent with their pre-existing views, while they limit exposure to diverse perspectives (information acquisition). Thus, activists tend to exhibit a higher level of information selection and transmission compared to information acquisition (J.-N. Kim & Grunig, 2011).

Investigating whether this association applies to online contexts by comparing predominant communication behaviors across the three public types would offer valuable insights. Accordingly, the final research question is posed:

RQ5: Are certain CAPS communication behaviors associated particularly with specific public types?

5. CAPS on Entertainment Issues

Recent high-profile scandals, legal battles, and societal debates highlight the entertainment industry's role as a major determinant of public discourse and controversy. Its multifaceted nature can be examined from four perspectives: product, experience, culture, and communication (Cavalcanti et al., 2021). As a product, entertainment consists of tangible elements such as plot, characters, and visuals. The experience perspective focuses on the audience's engagement and enjoyment. The cultural perspective situates entertainment within social contexts influenced by norms and values, while the communication perspective considers it a medium to convey messages to audiences. Collectively, these perspectives affect diverse entertainment sectors—media, music, film, gaming, theatre, sports, and tourism—which not only provide enjoyment but also foster cultural discourse (Stein & Evans, 2009). This complexity often leads to heightened public engagement and communication behaviors compared to other issues.

Further, the entertainment industries themselves seek to attract and maintain public attention actively, as this attention serves as a form of social approval (Alber & Heward, 2000) and often translates into financial gains (Bates & Ferri, 2010). Consequently, the industry attempts to lead or follow trending popular issues—current topics that receive extensive media coverage and generate significant public interest and discussion (J.-N. Kim et al., 2012). This endeavor stimulates active communication behavior further on the publics' part. In summary, both entertainment's nature and the entertainment industry's intentional efforts foster active communication behavior, which makes it a suitable context in which to analyze various online communication behaviors of publics within the CAPS framework and observe dynamic changes in public status during periods of controversy.

Given that publics tend to pay more attention to negative rather than positive popular issues (J.-N. Kim et al., 2012), this study focuses on the conflict between the Korean entertainment company ATTRAKT and its

famous idol, Fifty Fifty. This girl group debuted in November 2022 and found success initially with their hit song "Cupid," which achieved significant international fame, including charting on Billboard. The group gained further popularity after releasing their song "Barbie Dreams" with Kaliii for the soundtrack of the movie *Barbie*. However, their fame paradoxically drew widespread attention to their conflicts when the group accused their agency of a contentious contract dispute.

On June 19, 2023, the members filed a suit to suspend their exclusive contracts, alleging that the agency breached its obligations by failing to provide accounting data and neglecting their mental health. Major South Korean news outlets, including KBS, SBS, and MBC, reported this legal action on June 29, 2023. In response, the agency terminated the contracts of three members—Aran, Sio, and Saena—claiming that they had slandered and defamed the agency. In addition, the agency alleged that Warner Music Korea, the primary entity involved, attempted to exploit the artists using unlawful financial and power leverage. In a counteraction, the three former members filed a breach of trust claim against their agency, but lost the case in March 2024. The positions that both parties presented were compelling, which clouded the publics' judgment in determining the truth. The key dates of eight events that could affect public perception of this issue worldwide, together with brief descriptions of each, are shown in Table 1.

6. Method

To examine publics' online communication behaviors, this study used the YouTube API to collect online comments from major Korean news channels—KBS, MBC, and SBS. All three channels reported on the entertainment issue involving ATTRAKT and Fifty Fifty, nearly in real-time. This issue began on April 22, 2024, and continued until approximately August 28, 2024. During this period, eight events triggered significant public communication about the issue (see Table 1). Therefore, the comments analyzed were those posted between 24 hours before and 48 hours after each event from the news videos viewed most on each channel; in some cases, a report about the corresponding issue was available. In addition, comments from a news segment that reported Fifty Fifty's international fame, including their entry onto the Billboard charts, were included as a pre-issue event.

A total of 25,516 comments were collected, each including a user ID, the comment's text, the number of likes, and the publication time. As time passed, more recent news emerged that generated shifts in public opinion that made it increasingly challenging to analyze the entire dataset and led to the decision to apply the CAPS theory to only 10% of the total comments. Consequently, 2,554 comments were sorted based on the largest number of likes, and the top comments were selected for further analysis. The number of comments collected for each event is detailed in Table 1.

In this study, ChatGPT (GPT-4o version) was employed to classify the 2,554 comments into six CAPS dimensions (i.e., information seeking, attending, forefending, permitting, forwarding, and sharing) and three public groups (i.e., aware, active, and activists). The model was provided with definitions, key characteristics, and illustrative examples for each communication dimension (see Table 2) and was prompted to classify several example comments using a zero-shot prompting approach. This approach took advantage of the large language model to accelerate the classification process, and the authors verified the final classifications to ensure accuracy and reliability. The authors intervened in cases of incorrect classifications, identified inaccuracies, and refined the model's responses through repeated adjustments and re-prompts until the

Table 1. Timeline of key events affecting the entertainment issue of Fifty Fifty.

Event #	Date	Description
1	June 29, 2023	All members of Fifty Fifty file a request for a suspension of their exclusive contracts with the agency, ATTRAKT, at the Seoul Central District Court on June 19
2	July 6, 2023	First trial takes place on July 5
3	Aug. 1, 2023	Court refers the dispute between Fifty Fifty and the agency for mediation
4	Aug. 29, 2023	On August 28, Seoul Central District Court rejects the request to suspend the effectiveness of Fifty Fifty's exclusive contracts
5	Sept. 26, 2023	Court approves the request for provisional seizure of copyright fees for the amount embezzled by the outsourcing company, The Givers, on September 25
6	Oct. 24, 2023	Notice of contract termination given to three members
7	Dec. 24, 2023	The agency of Fifty Fifty files a lawsuit for 13 billion KRW against the three former members
8	March 11, 2024	Court confirms that the representative of Fifty Fifty's agency is "not guilty" of embezzlement

responses were consistent with a predetermined "golden answer." This refinement process, which took a month, ensured that the model met the expected classification criteria before it was applied to the full dataset. Following the final classification, two trained coders coded approximately 5% (n = 130) of the 2,554 comments independently for validation. Two rounds of intercoder reliability tests were conducted, and both yielded acceptable reliability scores (ranging from 0.76 to 0.83; Krippendorff, 2019; Neuendorf, 2002). A portion of the comments classified for CAPS dimensions and public classification by ChatGPT is displayed in Tables 2 and 3.

Table 2. Definitions, examples, and characteristics of communication behaviors used in the prompts for comment classification.

	Definition[1]	Characteristics of Comments	Example
Information Forefending	Fending off certain information based on its relevance and value for the problem.	Take selective approaches in dealing with information. Preconceiving certain claims or actions as harmful or beneficial. Belief that the solutions or outcomes to the problem are already clear or anticipated.	"I knew it. Isn't this an obvious outcome?" "I fully agree with this." "How did we end up with a result like this? Nonesense" "This is definitely manipulation."
Information Permitting	Simply accepting any information related to the problem.	Containing expressions of empathy, understanding, and acceptance toward the other person's opinion/perspective.	"That's right." "You've got a point." "Yeah, I agree." "I gotta admit, that's not wrong."
Information Forwarding	Giving information even if no one asks for it.	Providing additional information to others (e.g., a simplified summary, personal thoughts, feelings, new updates).	"That's not it…Can you hear me out for a sec?" "You might not know, but there was actually more to it than this." "Apparently, they're getting a lot of attention overseas right now."

Table 2. (Cont.) Definitions, examples, and characteristics of communication behaviors used in the prompts for comment classification.

	Definition[1]	Characteristics of Comments	Example
Information Sharing	Giving information only if someone asks for it.	Providing an answer to a specific question in response to one's demand or request.	"I'm only saying this because you asked…but the basic is 7 years." "Normally, I do not answer this kind of thing…but it started in February." "It's frustrating how narrowly some fans are viewing the situation. Listen up, Fifty Fifty fans—here's what's really going on"
Information Seeking	Deliberately searching for information to solve problems.	Requesting information (e.g., the identity of an entity, the background of a specific action/event, outcome/status of an event).	"Who are these people that are all over the news lately???" "Please tell me more" "Any idea when the next update coming out?"
Information Attending	Randomly encountering information.	Expressing curiosity or puzzlement. Recognizing current situations or changes.	"Oh. How is this possible?" "No way!" "This is crazy." "Doesn't seem like the old days anymore."

Source: [1] J. E. Grunig (2013).

Table 3. Definitions, examples, and characteristics of publics used in the prompts for comment classification.

	Definition[1]	Characteristics of Comments	Example
Aware Public	Individuals who recognize the issue and may express concerns with an issue but remain relatively inactive due to low engagement or high perceived constraints.	Comments are passive and observational, expressing immediate reactions, mild satisfaction or disappointment without expressing strong engagement.	"I didn't know this before…'' "I see. Something is happening with this group" "Good to know"
Active Public	Individuals with high awareness and engagement in an issue, often displaying strong emotional reactions or detailed information-sharing, but at an individual level.	Comments include detailed opinions or thoughts (suggestions or critiques), information, and a willingness to act on the issue, but without explicitly urging others to act collectively.	"Wake up, girls—This really isn't the time for this. You have to trust the company right now" "Stay strong. Remember, there are people on your side" "Considering what happened last time, they should not get another chance. I will prevent it…whatever it takes"

Table 3. (Cont.) Definitions, examples, and characteristics of publics used in the prompts for comment classification.

	Definition[1]	Characteristics of Comments	Example
Activist	A group of highly aware and engaged individuals with a deep understanding of an issue, who take action or encourage others to act collectively to drive change and achieve specific goals.	Comments explicitly express a willingness to take action or call on others to act, advocating for strong legal measures, industry bans, or other specific collective actions targeting individuals or entities involved.	"Let's boycott this group" "I fully support this idea. Let's start a new audition" "Remember them and ensure they never debut in another K-pop group. They should be banned from ever working in this industry" "All involved scammers should be sent to the court"

Source: [1] J. E. Grunig (2013).

7. Results

The five research questions were formulated to explore the online communication behaviors of various publics. RQ1 focuses on the most prevalent communication behaviors within the CAPS framework during the course of an entertainment issue. The results indicated that information transmission was the action observed most frequently (n = 2,599), followed by information selection (n = 2,388). In contrast, information acquisition was observed far less frequently (n = 821).

Further analysis of each communication behavior's active and passive dimensions showed that information forefending alone was observed more than two thousand times, which made it the most prominent among the six subdimensions (n = 2,386). This was followed closely by information sharing, which was observed nearly two thousand times (n = 1,994). The remaining dimensions occurred fewer than 700 times each. For example, information forwarding was noted 605 times, and information attending was observed 588 times, while information seeking was recorded 233 times. Information permitting was observed the least, with only two comments (see Figure 2).

When the results are organized chronologically according to the eight key events, the ratio data in Figure 3 indicated that information selection remained consistently high throughout these events. Notably, regardless of the number of events reported during those months, the highest level of information selection was observed when Fifty Fifty entered the Billboard charts before the issue erupted. In contrast, following the outbreak of the issue, information acquisition experienced a rapid increase after Event 1 (0.90) and has not declined to pre-issue levels since (0.60). Information transmission also saw a rise after the issue emerged, although not as sharply as information acquisition (before the unfolding of the issue: 0.43, Event 1: 0.53). Subsequently, it dropped (Event 2: 0.28; Event 3: 0.19) despite the occurrence of other events. Only after the news reported that the issue had been resolved in court did information transmission increase again (Event 8: 0.50), nearly to the level observed during Event 1.

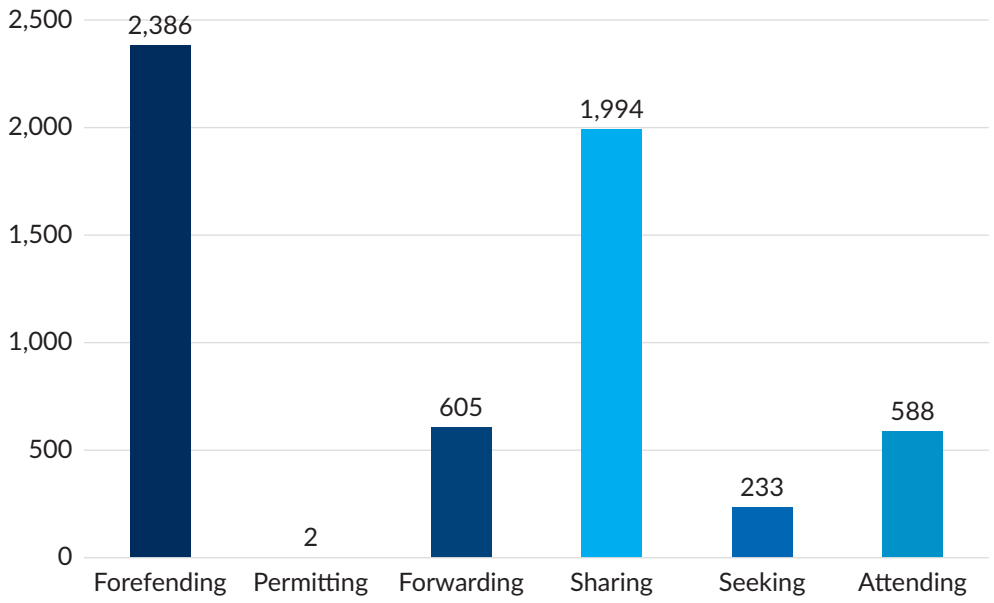

Figure 2. Number of each communication behavior in six dimensions.

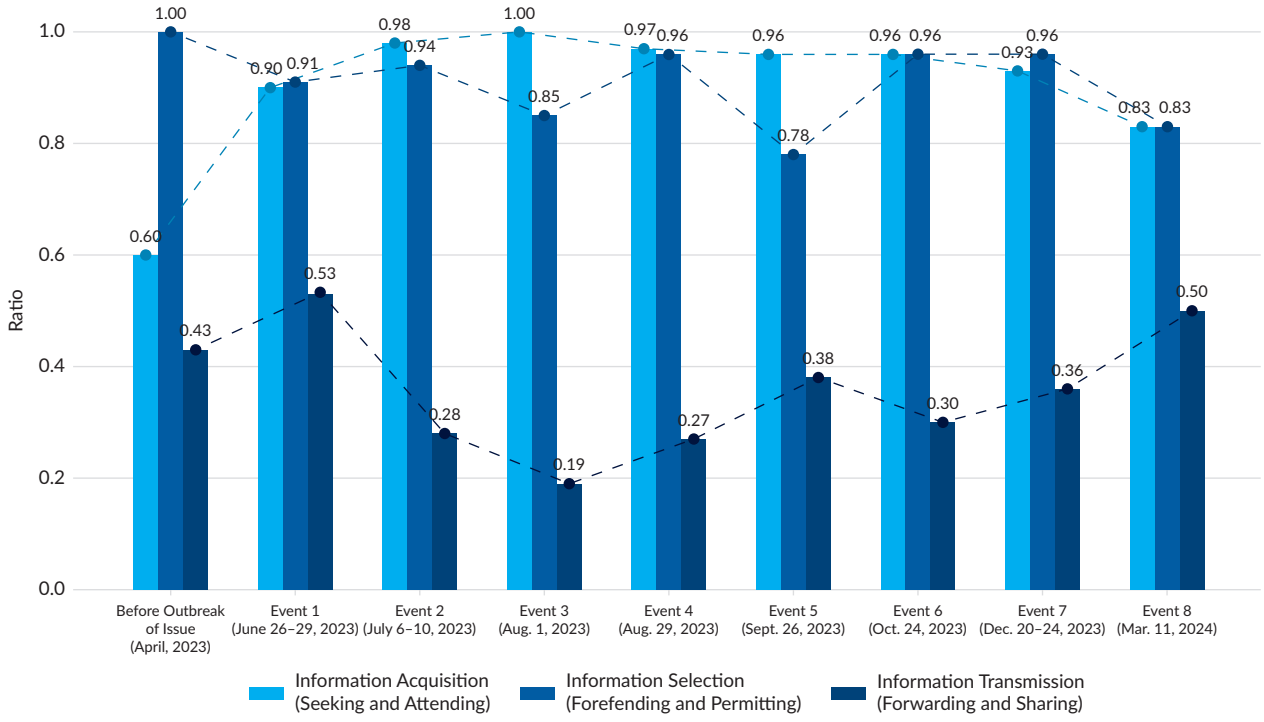

Figure 3. The transition of ratio of each communication behavior.

RQ2 focuses on the combinations of communication behaviors within the CAPS framework. A total of 25 combinations were observed. The combination that occurred most frequently was information forfending and information sharing, which appeared over 1,200 times. The second combination observed most was information forfending paired with information sharing and attending (n = 361), followed by information forfending combined with information forwarding (n = 262) and the combination of information forfending, forwarding, and sharing (n = 182).

In addition, combinations that involved four dimensions were noted, such as: information forfending, forwarding, sharing, and seeking (n = 23); information forfending, forwarding, seeking, and attending (n = 16); information forfending, forwarding, sharing, and attending (n = 11); and information forfending, sharing, attending, and seeking (n = 10).

RQ3 focuses on identifying which public type was observed most frequently during the entertainment issue. As illustrated in Figure 4, the numbers of aware publics (n = 1,027) and active publics (n = 1,034) were quite similar. In contrast, the number of activists was notably lower and comprised less than half the total of the other public types (n = 490).

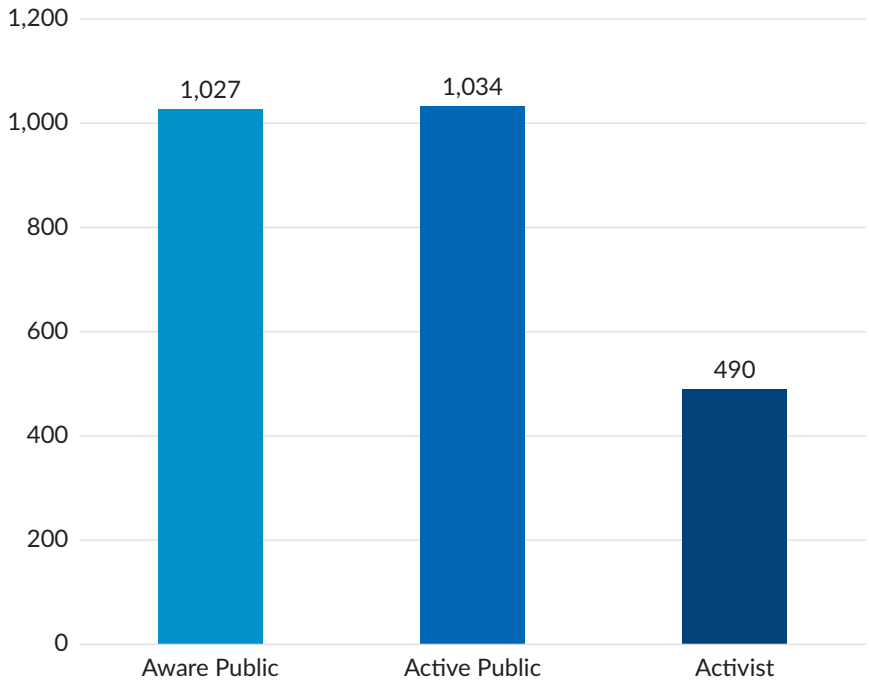

Figure 4. Number of individuals observed for each public type.

RQ4 examines the dynamics of public types during the entertainment issue. As illustrated in Figure 5, the ratio of each public type fluctuated continuously throughout the issue. Notably, the ratio of activists increased gradually from Event 1 (when the issue was announced) to Event 3 (the day the Seoul Central District Court dismissed the request to suspend Fifty Fifty's exclusive contract; Event 1 = 0.08; Event 2 = 0.19; Event 3 = 0.25). In contrast, the ratio of active publics, which was highest at the onset of the issue (0.67), declined at Event 4 (0.27), the day after the Seoul Central District Court rejected the request to suspend the effectiveness of Fifty Fifty's exclusive contracts. However, then it increased gradually and reached 0.34 at Event 6, 0.38 at Event 7, and 0.41 at Event 8 when the court determined that the representative of Fifty Fifty's agency was innocent of embezzlement.

RQ5 asks whether the differences among each dimension hold significant meaning based on public types. A Chi-square test was conducted, and as illustrated in Figure 6, the post-hoc analysis revealed that most p-values were less than 0.05. This finding indicates a significant relation between the communication behaviors identified in the CAPS framework and the various public types, with the exception of the information transmission value between active and activist publics (p = 0.14).

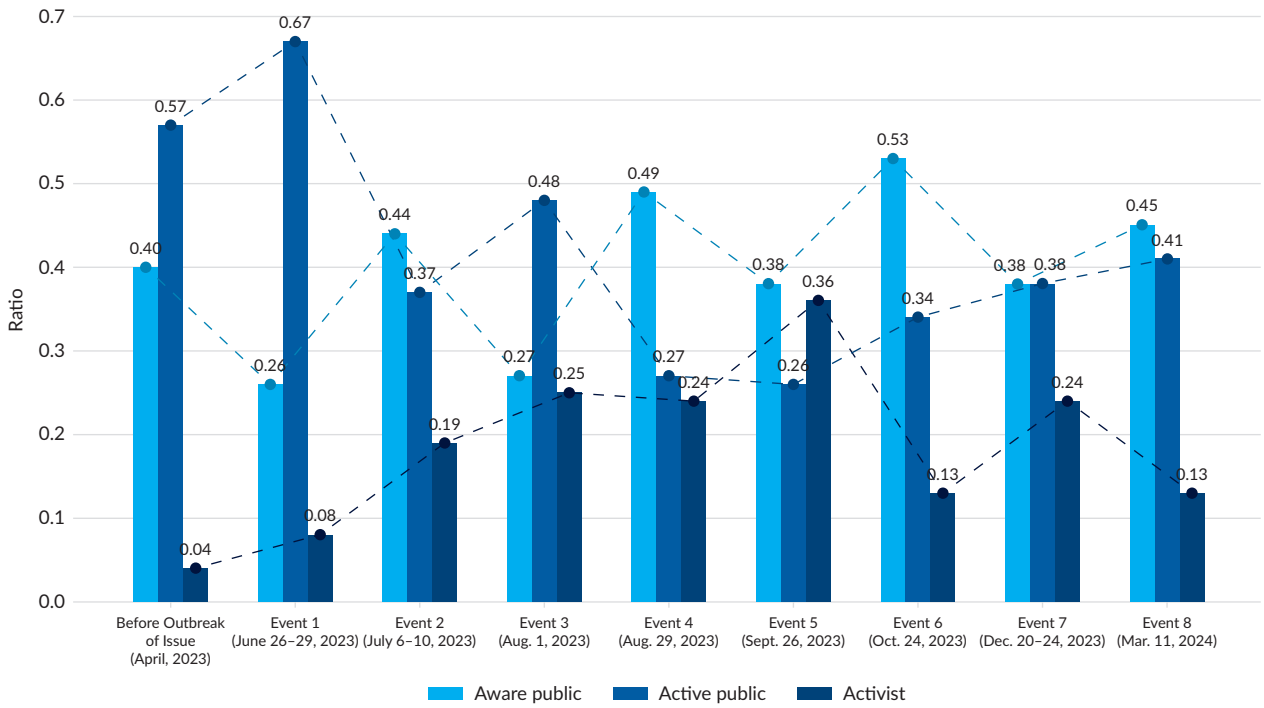

Figure 5. The transition of the ratio of each public type.

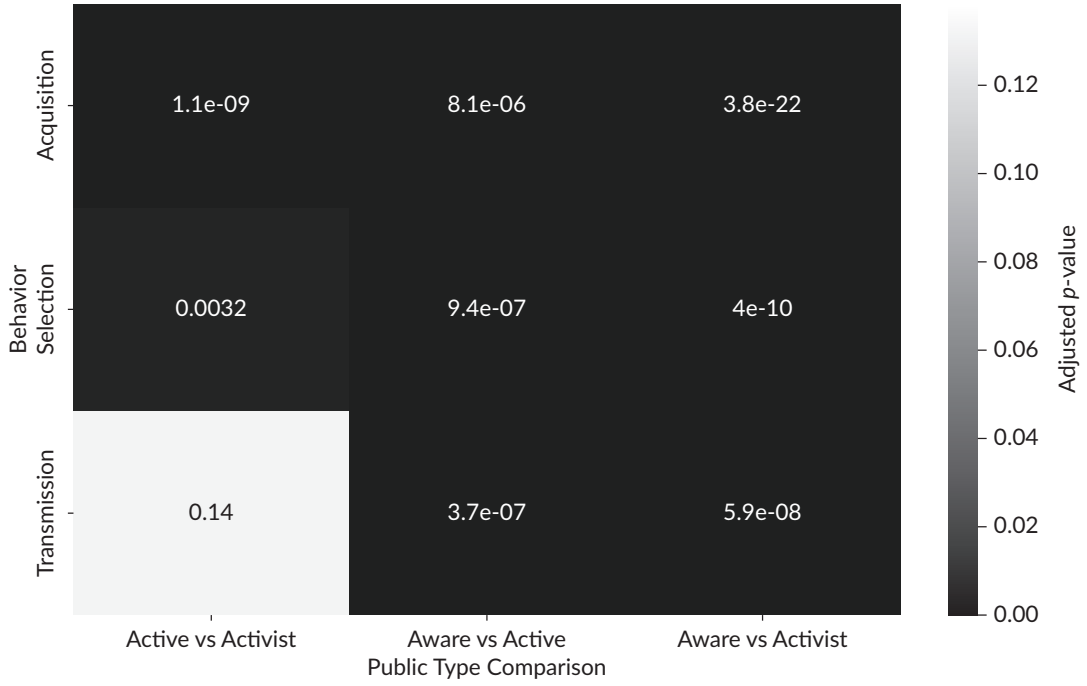

Figure 6. Post-hoc pairwise comparison between CAPS and public types.

Specifically, as shown in Figure 7, information acquisition diminished as the publics' activeness with respect to the issue increased. In addition, both information selection and information transmission, which were at high levels already, continued to rise with increasing public activeness, although this shift was not as dramatic as that of information acquisition.

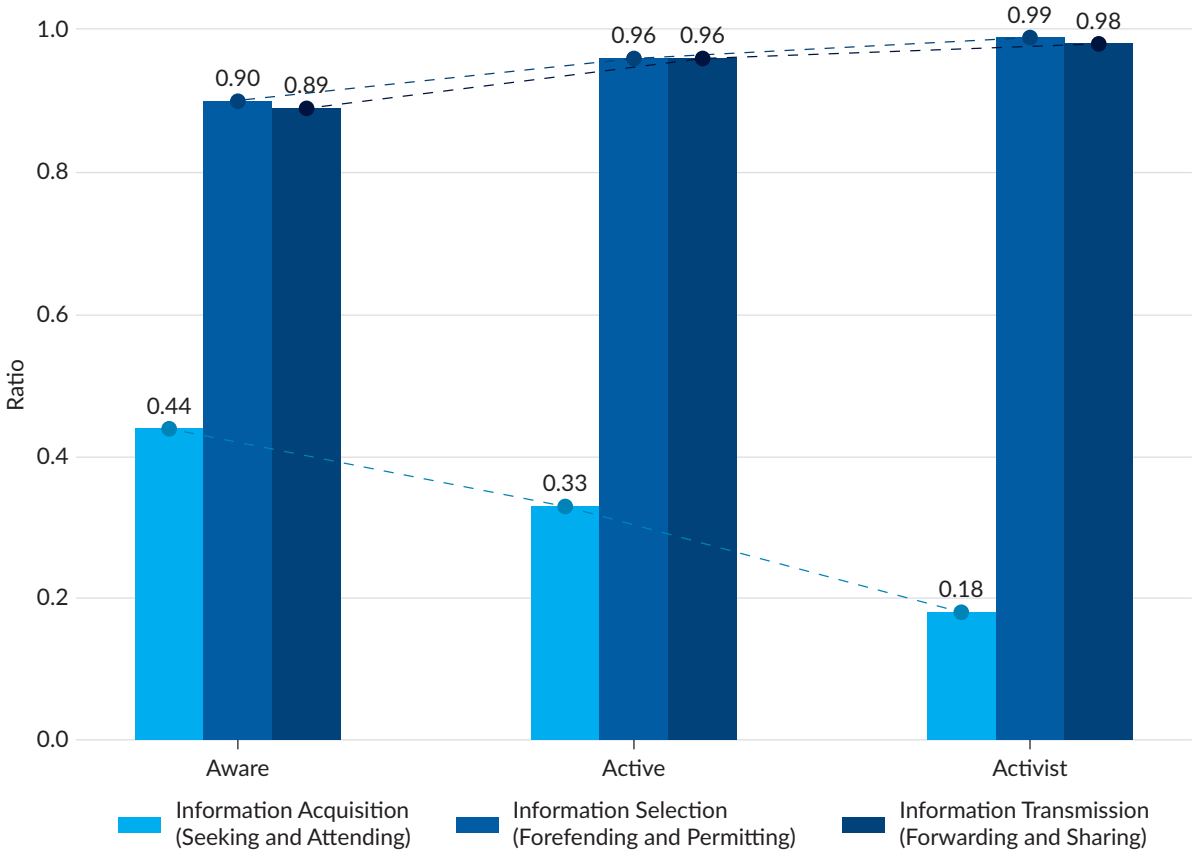

Figure 7. Correlation between online communication behaviors and public types.

8. Conclusion

Despite its significant potential and opportunities, the use of extensive datasets and computing technology in public relations remains largely unexplored (Holtzhausen & Zerfass, 2015; J. E. Grunig, 2023; Wiesenberg et al., 2017). Aldoory and Sha (2007) suggested that reassessing CAPS in the context of advancements in digital media technologies would be valuable. Building on this foundation, this study addressed the limitations of previous CAPS research, which had relied primarily on traditional methods. Then, it proposed adopting data-driven approaches to enhance the understanding of publics' online communication behaviors and their association with different public types.

With respect to communication behaviors, all three information dimensions—selection, transmission, and acquisition—were observed. Active communication behavior is often more pronounced in the context of persistent controversial issues (J.-N. Kim & Grunig, 2011; S. Kim et al., 2015). However, in this study, active communication behavior (i.e., information forfending) was only identified in information selection. In contrast, more passive communication behaviors (i.e., information sharing and information attending) were prevalent in information transmission and acquisition. This prevalence can be attributed to the nature of leaving comments online, which inherently constitutes an information-sharing behavior. On the other hand, the higher incidence of information attending can be explained by this issue's unique context. In previous conflicts between entertainment companies and their celebrities, the companies were often accused of wrongdoing. However, the Fifty Fifty case was exceptional, in that the idol girl group was found

to violate standards. This rare event may have captured public attention more than usual, as reflected in reactions such as "It's the first time I feel sorry for an entertainment agency" and "I can't believe the CEO got really betrayed."

With respect to transition, communication behaviors evolve continuously with each new event related to an issue. This suggests that there is no single fixed communication behavior for an issue, but rather, it is a dynamic process influenced by unfolding events. In addition, the study identified various combinations of communication behaviors. Specifically, individuals utilized between one and four dimensions within a single comment. Among the 2,554 comments analyzed, 75.02% (n = 1,916) contained both information forefending (active) and information sharing (passive). This finding supports the notion that both passive and active dimensions of CAPS coexist, as posited by J.-N. Kim and Krishna (2018). Further, it shows that many publics demonstrate a proactive tendency online to evaluate the value and relevance of information in a given problem-solving context and share information online simultaneously (J.-N. Kim et al., 2010). At the same time, active information selection combined with passive information transmission may also indicate a cautious approach to an oppositional issue, as there is hesitancy to share messages with the broader public about a contentious online discourse.

On the other hand, the findings of this study showed that all three public types were present in online comments: aware, active, and activist. Notably, the number of publics that exhibited characteristics of aware publics was comparable to that of active publics. This finding is consistent with that of Baym's (1996) study and reaffirms that digital platforms lower the threshold for the aware public to engage in online discourse. While organizations have prioritized publics who show actions individually (active public) or collectively (activists public) when an issue arises, it is now essential to give equal attention to the aware public.

In addition, this study highlights public behaviors' dynamism. Initially, active publics' communication behaviors were prominent, but this shifted gradually toward those of the aware and activist publics. Further, while active publics' communication behaviors tended to diminish after an issue was resolved, the numbers of aware and activist publics remained high. This observation is consistent with Aldoory and Grunig's (2012) assertion that activist publics often transition into aware publics when issues receive less attention. Therefore, organizations should focus on engaging active publics at the onset of an issue and embrace the aware and activist publics subsequently as time progresses.

Finally, as illustrated in Figure 1, this study found a close relationship between public types and online communication behaviors. This result reconfirms the notion that as public engagement increases, the tendency to acquire information decreases, and this gap is replaced by enhanced transmission and selection of information.

9. Implications

This study has both academic and practical implications. Academically, it integrates large-scale data and data-driven techniques into a theoretical model for public relations research and enhances its applicability in the digital era. J. E. Grunig (2023) endorsed this approach and Helles and Ørmen (2020) also recognized its value. In particular, this approach presents an empirical visualization of the sequential illustration of motivated information behavior in a problematic situation, as illustrated conceptually in Figure 1. This

visualization provides a clear representation of the communication characteristics associated with each public type and enhances the understanding of how different groups engage with information during certain issues.

This study also found compelling evidence that publics are not static entities. Rather, they exhibited dynamic characteristics by adjusting their status continuously in response to situational changes, as J. E. Grunig (2013) explained. Similar to communication behaviors, even within a single issue, fluctuations in public status are observed depending upon the events that arise. This fluidity challenges traditional research methods that commonly show only a snapshot of publics at a single point in time, and underscores the need for more data-driven approaches that account for the evolving nature of public types over time.

Further, this study emphasizes the urgent need for a comprehensive discussion of the characteristics of aware publics in online environments. Prior studies already consider aware publics as one of the most critical problem solvers, as they are responsible for rapid issue emergence and play a crucial role in the way that issues evolve and subside. Therefore, scholars have suggested that organizations pay close attention to them (J. E. Grunig, 1997; L. A. Grunig et al., 2002; Ni & Kim, 2009). However, beyond this, as the landscape of public engagement online evolves, this demonstrates the increasing importance of reconsidering and potentially revising the current definition of aware publics. The findings suggested that these groups have transitioned into a distinct public type that participates in discussions actively and thereby warrants further academic inquiry into their unique attributes and behaviors.

With respect to practical implications, this study highlights the need for more proactive communication management targeted at aware publics, as publics with these characteristics are observed consistently in large numbers online. Communication is more likely to be effective with aware publics than with active publics, as they are almost at the stage of recognizing a problem but have not yet communicated about it with others (J. E. Grunig, 2013). Therefore, it is advisable for organizations to engage with them first, before they are exposed to incorrect information.

Another practical implication is that this study's findings highlight a significant shift in the methodology used to identify different public groups. Traditional survey methods may no longer be necessary, as computational analysis offers a more effective way to gain insights into publics' online communication behaviors. By training AI, it is even possible to identify the types of comments on an issue that various publics left. This will enable organizations to understand these publics' characteristics better, e.g., whether they are likely to engage in individual or collective actions and implement proactive measures to prevent extreme situations. Thus, organizations are encouraged to invest in hiring data scientists rather than relying on survey companies, and to develop social media monitoring tools that can identify and track key publics and their communication behaviors related to issues effectively (Ampofo et al., 2015). This strategic shift not only streamlines the research process but also enhances the organization's ability to develop informed communication strategies that resonate with its target audiences.

10. Limitations and Future Studies

This study has its limitations, as it focuses on a single public relations model and examines only one entertainment-related issue. Therefore, the findings cannot be generalized to the broader field of

communication. It is recommended to apply this data-driven approach to a wider range of issues, such as health crises, climate change, and national conflicts, which may reveal new dominant communication behaviors and unique combinations of the various CAPS dimensions.

In addition, this study is limited by the fact that it analyzed only 10% of the full dataset. As the comments selected consisted primarily of the comments with the most likes, this selection bias may have influenced the results. Future studies should examine a more representative sample of comments to gain a comprehensive understanding of public communication behaviors.

Further, the fact that the transition of commentators' activity levels over time was not tracked at the individual level. Instead, each comment was analyzed independently and focused solely on the language used in online posts. Consequently, it was not possible to assess whether a commentator became more or less active over the course of events, which could lead potentially to misclassifications of the public's status. For instance, if a commentator did not explicitly express a willingness to take action in an online comment, they were categorized as an aware public, although they might have actually been an active or activist commentator. To address this limitation, future research is encouraged to implement a computational tracking approach to monitor individual commentators over time, which would provide deeper insights into public dynamics and behavioral shifts.

Another limitation of this study is the presence of some inconsistencies in the analysis results that ChatGPT provided. Future research should extend this approach to other generative AI chatbots to assess which model demonstrates greater consistency and fewer discrepancies in classification accuracy.

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Conflict of Interests

The authors declare no conflict of interests.

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