

Beyond naval manoeuvres: Perception as battlespace in *Mare Aperto 2025* – strategic communication and cognitive warfare in joint-force training

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Abstract

As contemporary conflicts expand beyond the physical domain, and unfold within mediated communication, the social domain of cognitive warfare has become central yet underexplored. This article examines how strategic ambiguity operates as a key dynamic within hybrid media environments through the analysis of communicative dynamics observed during the *Mare Aperto 2025* military exercise. Using a multi-method analytical approach combining natural language processing, social network analysis, and qualitative interpretation, the study reports interactions on a closed-instance social media platform. The analysis shows that emotionally salient, concise, and timely messages were associated with higher engagement, while actors with ambiguous identity signals contributed to delayed attribution, fragmentation, and escalation. A case analysis of a hybrid actor further illustrates how ambiguity can disrupt interpretation. The article conceptualizes strategic ambiguity as a communicative mechanism shaping attention, interaction, and attribution in mediated conflict.

Keywords

cognitive warfare, hybrid actors, mediated conflict, military exercise, strategic ambiguity, strategic communication

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Introduction

When images of the Bucha massacre started circulating in April 2022, the struggle was not only over what had happened on the ground, but over who could define its meaning first and most effectively across official statements, legacy media, social platforms, denial, and recycled visual products. In this dimension of conflict (Claverie et al., 2021; Hoskins and O'Loughlin, 2010), the decisive contest is not reducible to propaganda in the traditional sense, nor only to the truth or falsity of individual claims. It is a contest over attention, interpretation, and trust. This is the environment where the cognitive dimension of conflict becomes socially visible, as a struggle over mediated interpretation rather than just physical events, a dynamic consistent with accounts of mediated spectatorship (Chouliaraki, 2013). NATO's recent work on cognitive warfare shows how the target is no longer simply information systems or battlefield perceptions, but cognition as it is shaped through communication, social engineering, and the erosion of public trust (Du Cluzel, 2021; NATO, 2023). However, in spite of the increasing attention, the communicative mechanisms through which such cognitive effects are produced remain insufficiently understood. For the purpose of this article, we exclusively focus on the social dimension of cognitive warfare: the mediated struggle over how people interpret events, evaluate sources, and make decisions, particularly under conditions of crisis escalation (Ortega Chávez, 2026). In this sense, the cognitive dimension is inseparable from communication dynamics. This article approaches cognitive warfare not as a distinct doctrinal domain (Claverie et al., 2021), but as a communicative phenomenon emerging at the intersection of media systems, organizational communication, and influence practices. Rather than treating these literatures separately, we bring them into dialogue by focusing on how communication operates under conditions of mediated conflict. In doing so, we distinguish between messages (individual communicative units), narratives (patterns of meaning emerging across messages), and communicative dynamics (the interactional processes shaping their circulation and interpretation).

Despite increasing doctrinal attention, the cognitive dimension of warfare remains underexplored, and is still characterized by limited empirical understanding of its communicative dynamics. Scholarly contributions show that cognitive warfare is still conceptually unsettled (Prébot, 2026), with significant overlap between related constructs such as information operations, strategic communication, Foreign Information Manipulation and Interference, and hybrid threats (Deppe and Schaal, 2024). Thereby cognitive warfare is often treated as a high-level strategic or doctrinal concern, but still not frequently examined as a set of communicative mechanisms in mediated environments. Much of the academic debate still focuses on definitional work and studies of disinformation and narrative or platform manipulation. This leaves a gap in understanding the dynamics through which conflict communication generates cognitive disruption. This study addresses this gap by integrating strategic ambiguity theory (Eisenberg, 1984) with hybrid media dynamics (Chadwick, 2011; Vaccari et al., 2015) to explain escalation, propagation, and engagement within the cognitive dimension of conflict. We argue that, under hybrid media conditions, strategic ambiguity can be understood as a communicative mechanism rather than merely a property of messages. Since Eisenberg's (1984) work, ambiguity has been understood not merely as communicative failure but as

a strategic resource that allows organizations and institutions to sit in a grey area, where they can preserve deniability, coordinate heterogeneous audiences, and protect actors operating under incompatible expectations (Von der Wense and Hoffjann, 2023). Hybrid media system theory, in turn, explains how power emerges from the interaction of different media logics and from the ability to manage information flows across platforms, institutions, and publics (Chadwick, 2013; Chadwick et al., 2015; Vaccari et al., 2015). Bringing together these perspectives allows us to examine how ambiguity becomes operational within environments characterized by rapid circulation, contested attribution, and fragmented audiences. While existing studies have examined disinformation, virality, and narrative contestation, fewer have focused on how ambiguity operates as a mechanism of disruption. Existing work has shown that contemporary political and conflict communication develops in polarized but interconnected environments where attention, narrative struggles, and platform logics determine what becomes salient (Chadwick, 2011). What remains underdeveloped is an understanding of how ambiguity functions within such environments as a mechanism shaping engagement, escalation, and interpretive instability. This article advances the claim that, in hybrid media environments, strategic ambiguity operates as a communicative mechanism through which cognitive disruption is generated and amplified. In such environments, ambiguity becomes effective because it travels across incompatible media logics more easily than coherent, structured narratives. It can trigger reaction, delay verification, allow for plausible deniability, and enable amplification by actors who do not share the same goals but nevertheless contribute to circulation.

We develop this argument through the analysis of communication produced during the Italian Navy's exercise *Mare Aperto 2025*, the Navy's main annual maritime training activity, organized as a large-scale, realistic, multi-domain exercise involving complex and developing crisis scenarios and multiple actors. The analysis combines real-time sentiment tracking, interaction network mapping, and qualitative classification of message features to examine how ambiguity and emotional dynamics shape communication outcomes. The study is based on embedded analytical observation within a simulated communication environment, allowing real-time observation of communicative dynamics.

Our analysis is guided by a set of analytical propositions rather than formally testable hypotheses. We focus on three interrelated dimensions: (1) the interaction between emotional intensity, informational density, and temporal relevance in shaping engagement; (2) the role of ambiguity in message construction and actor identity in generating escalation and interpretive divergence; and (3) the potential role of real-time analytical feedback in supporting adaptive communication under conditions of uncertainty.

The next section develops the theoretical framework by integrating cognitive warfare in its social and communicative dimension with strategic ambiguity and principles of hybrid media system theory. Section 3 explains the methodology, including the *Mare Aperto* exercise context. Section 4 presents the analysis, while section 5 discusses the findings in relation to the theoretical background. Finally, section 6 highlights their main implications for understanding communicative dynamics in the cognitive dimension and identifies directions for future research.

Theoretical framework

The cognitive dimension of conflict has moved to the centre of both scholarly and institutional attention. Yet the growing use of the term cognitive warfare has not produced conceptual clarity and remains marked by competing analytical approaches (Russo and Yazdanjue, 2026). This study brings into dialogue insights from information and communication research (media dynamics, message circulation) and organizational communication (strategic ambiguity) to examine how communication produces cognitive effects in mediated environments.

Cognitive warfare in its social and communicative dimension

At its core, cognitive warfare seeks behavioural change by altering cognition, understood as the processes through which information is acquired, stored, retrieved, and processed (Bayne et al., 2019). It is therefore framed as an attack on perception, understanding, and decision-making (Deppe and Schaal, 2024). Unlike conventional warfare, it operates through symbolic environments in which communication shapes interpretive frames (Miller, 2023; Watzlawick et al., 1972; Hoffjann, 2026). In such environments, communication does not merely transmit information but actively structures how reality is interpreted and acted upon.

Strategic content and signals shape social realities while altering the conditions under which cognition operates. These effects are amplified through cognitive biases and emotional arousal. Prior studies show that fear-based messaging influences audiences, while negative emotions entrench conflict narratives and hinder peace processes (Ćosić and Srbljinović, 2018; Ćosić et al., 2026; Tannenbaum et al., 2015). Emotional activation plays a central role in shaping engagement and response dynamics, as affectively charged messages are more likely to trigger reaction, attention, and interaction. In cognitive warfare, emotional triggers therefore figure as tools of manipulation and polarization (Paziuk et al., 2025).

Foundational doctrinal documents frame cognitive warfare as a domain operating at the intersection of social psychology, behavioural influence, and technological mediation (Du Cluzel, 2021; Stato Maggiore della Difesa, 2023). The Ministry of Italian Defense distinguishes three interrelated vectors: social (identity formation, emotional contagion, and group cohesion); psychological (cognitive biases, memory manipulation, and adversarial framing); and technological (platforms, algorithms, anonymity layers, and propagation velocity) (Stato Maggiore della Difesa, 2023). This multi-dimensional perspective highlights that cognitive effects do not emerge in isolation, but through the interaction between psychological processes, communicative practices, and technological infrastructures.

Focusing on the social vector highlights communication as the mechanism through which identities, emotions, and group boundaries are produced (Li et al., 2026; Lu and Hong, 2022; Ma et al., 2025) and contested. Communication is therefore not merely a vehicle of influence but a core condition of cognitive warfare. Rather than treating it abstractly, we understand it as a concrete domain of targets and effects: public opinion, collective identity, and societal cohesion. In this sense, cognitive warfare operates as a

form of control over mental states and behaviours through the manipulation of environmental stimuli (Hung and Hung, 2022), generating effects including disrupted decision-making processes, social polarization, instrumentalized identities and erosion of the will to resist (Deppe and Schaal, 2024; Putter, 2025).

Accordingly, this article conceptualizes cognitive warfare as an employed strategy through which actors seek to influence, manipulate, or disrupt cognitive processes by shaping communicative environments and interpretive conditions. This study focuses on the social vector, examining communication as the primary site where cognitive effects are produced.

A key question concerns the relationship between cognitive warfare and strategic communication (StratCom). We argue that StratCom is part of the communicative dimension of cognitive warfare as both rely on strategic narratives to shape shared understandings and behaviour (Miskimmon et al., 2015; Roselle et al., 2014). While not synonymous with cognitive warfare, StratCom provides the institutional framework through which such communicative logics are operationalized (NATO, 2023; Mohammad 2021). In this sense, StratCom offers an empirical entry point for observing how coordinated communication attempts to structure perception and response in practice. Its manoeuvres therefore offer observable cases of how coordinated messages shape perceptions and behaviour.

This justifies examining StratCom manoeuvres to understand cognitive dynamics. Because contents serve as the primary vectors of cognitive intervention (Hung and Hung, 2022), the coordinated orchestration of messages in StratCom renders observable the communicative processes through which perceptions and behaviours are shaped. StratCom exercises therefore provide a structured yet dynamic environment in which communicative processes can be observed and allow systematic analysis of the production, circulation, and effects of such communicative content.

Strategic ambiguity

Rather than a communicative failure, strategic ambiguity is best understood as a purposive way to manage meaning that becomes particularly useful when actors must coordinate heterogeneous audiences, preserve a grey area of action, and avoid being framed through a single interpretation, especially in environments characterized by plurality and contestation (Von der Wense and Hoffjann, 2023). Early work on strategic ambiguity posits that ambiguity maintains unified diversity, facilitates change, preserves privileged positions, and supports deniability, thereby allowing different actors to believe they are aligned while attaching different meanings to the same message (Eisenberg, 1984). Commitment to multiple strategic goals can be sustained through rhetoric that is internally consistent enough to sustain action yet sufficiently flexible to accommodate divergent institutional stories and audience expectations (Jarzabkowski and Sillince, 2007). Similarly, in political science literature, strategic ambiguity is framed as a deliberate effort to reduce the salience of divisive topics and allow different audiences to project preferred meanings onto a political actor or platform (Page, 1976).

Academic literature also shows that ambiguity helps organizations limit scrutiny, diffuse responsibility, and soften categorical judgments when they operate in morally

contested spaces (Vergne, 2012), and stigmatized practices can persist partly because organizations learn to manage exposure and interpretation instead of confronting criticism (Reinmoeller and Ansari, 2016). Organizations or institutions facing public scrutiny can actively maintain strategic ambiguity through struggles over opacity, equivocality, and absurdity, thereby confusing or neutralizing external evaluators and protecting themselves from the spotlight (Cappellaro et al., 2021).

In studies on diplomacy and security, scholars have shown that strategic ambiguity functions as a dual deterrence device, designed to simultaneously send reassuring and cautionary signals to different parties without foreclosing policy flexibility (Boon and Sworn, 2020). Constructive ambiguity is also useful where preferences are heterogeneous and legal or institutional foundations are weak, as it enables agreement and movement precisely because it postpones definitive resolution of contested meanings (Jegen and Mérand, 2014). In this sense, strategic ambiguity is closely connected to escalation control since it keeps attribution and intent sufficiently indeterminate to prevent rapid interpretive closure.

Existing literature strongly supports treating ambiguity as a strategic resource (Cappellaro et al., 2023), yet it has only partially addressed what happens when ambiguity is injected into networked media systems in which messages are instantly recontextualized by journalists, publics and anonymous actors, and where visibility, emotional reaction, and contested attribution can themselves become strategic effects. Here, ambiguity may actively generate engagement, interpretive conflict, and escalatory dynamics by making messages more portable across audiences, more difficult to verify quickly, and more available for selective amplification. To understand these dynamics, it is necessary to consider how ambiguity interacts with the broader media environment in which conflict is mediated. The following section examines this interaction through hybrid media system theory.

Dynamics of hybrid media environments

Hybrid media system theory provides a particularly useful framework for this study because it shifts attention away from isolated messages or single platforms and toward the recursive circulation of political communication across interconnected media settings, where older and newer logics are continuously recombined rather than simply replaced (Chadwick, 2011; Jungherr et al., 2019). Rather than applying the full scope of hybrid media system theory, this study leverages specific implications, particularly the circulation of content across heterogeneous media logics, the role of visibility and engagement, and the instability of actor attribution.

In this perspective, power does not rest exclusively with any one institution or platform, but with those actors that are most capable of redirecting and exploiting information flows across heterogeneous environments, moving content between social media, mainstream journalism and networked publics in ways that modify the visibility and agency of others (Jungherr et al., 2019). This is where the problem of actor ambiguity becomes relevant: in hybrid media environments, communication is constantly

reinterpreted, reframed, and redistributed across actors and platforms, making meaning and attribution inherently unstable (Chadwick et al., 2015). Once communication enters such environments, the boundaries between journalist and source, politician and media entrepreneur, or citizen and activist become less stable because the same communicative intervention can be reframed and redistributed by very different actors without a clear or lasting distinction between origin, endorsement, and amplification. What matters, then, is not only who speaks first, but how it circulates, who becomes visible as a credible node, who amplifies it, and how it is interpreted across different communicative contexts, thereby making hybrid media environments structurally favorable to ambiguity as they reward content that can be reinterpreted and reframed while sustaining multiple interpretations. The literature on agenda setting supports this by showing that, while social media have weakened exclusive gatekeeping authority, they have not displaced legacy media so much as forced them into reciprocal interdependence, where issues often emerge through cross-platform interactions and are consolidated only when different actors and platforms converge around them (Gilardi et al., 2022).

Ambiguous actors do not need to control the whole information environment to matter, but only inject content that is sufficiently resonant, affectively charged, or strategically timed to be taken up by more visible actors who then provide broader diffusion. In this context, actors whose identity signals remain partially indeterminate, such as anonymous, hybrid, or ironic communicators, may be particularly effective, as they benefit from both visibility and interpretive flexibility.

The principles of hybrid media system theory help explain how communicative dynamics are shaped not only by message content, but by patterns of circulation, amplification, and reinterpretation (Chadwick et al., 2015). When integrated with strategic ambiguity, these dynamics create conditions in which communication can generate engagement, delay attribution, and sustain interpretive contestation. This interaction between ambiguity and hybrid media dynamics provides the basis for the analytical propositions developed in the following section.

Analytical proposition

Building on the integration of cognitive warfare as a communicative phenomenon, strategic ambiguity, and hybrid media system theory, this study derives a set of analytical propositions to guide the interpretation of communicative dynamics observed during the exercise. Given the exploratory and embedded nature of the research design, these propositions are not treated as formally testable hypotheses, but as interpretive anchors derived from the theoretical framework. The analysis focuses on three interrelated dimensions: the role of message characteristics in shaping engagement, the impact of actor ambiguity on interaction dynamics, and the potential role of analytical feedback in supporting adaptive communication under conditions of uncertainty.

PI – Strategic ambiguity-driven engagement dynamics. Messages characterized by high emotional polarity, low informational density, and high temporal relevance are expected to generate engagement and deeper interaction structures as they are more easily circulated and reinterpreted across heterogeneous communicative contexts.

P2 – Actor ambiguity and escalation dynamics. Actors displaying ambiguous identity signals (e.g. anonymity, hybrid positioning, ironic tone) are more likely to generate interpretative divergence, escalation, and fragmentation within interaction networks.

P3 – Analytical feedback and adaptive communication. Real-time analytical feedback (e.g., sentiment tracking, network mapping) may support adaptive communication under conditions of high uncertainty by enabling faster interpretation and more coordinated responses under conditions of interpretive uncertainty.

These propositions do not aim to establish causal relationships or generalizable effects. Instead, they function as interpretive anchors, evaluated through the triangulation of sentiment patterns, interaction structures, and qualitative analysis, as detailed in the methodology section.

Methodology

Research design and operational context

This study adopts a simulation-based case study design, leveraging *Mare Aperto 2025* as a live simulated operational environment to observe communication and cognitive dynamics within a joint-force training context. Rather than a controlled experiment, the research adopts an embedded observational approach, combining elements of participant observation with real-time analytical interpretation within the EXCON (Exercise Control) structure.

Within the EXCON structure, a dedicated analytical cell was tasked with observing and interpreting the unfolding narrative contest, producing real-time analytical outputs to support situational awareness. The team did not generate content within the simulated communication environment and did not intervene in participant behaviour; its role remained analytical and interpretive. This positioning aligns with embedded research approaches, where analytical proximity enables contextual understanding while maintaining separation from direct intervention (Czarniawska, 2007; Kawulich, 2005).

The exercise involved two opposing factions engaged in both kinetic and informational activities. The Blue Team represented the friendly or institutional actor, while the Red Team simulated adversarial behaviour, introducing disruption, ambiguity, and contestation (Zenko, 2015). Within the communication environment, both factions operated through dedicated communication cells responsible for content production and interaction. While guided by broad strategic objectives, communicative activity was not strictly scripted, allowing interaction dynamics, such as amplification, fragmentation, and escalation, to emerge organically through participant engagement, thereby enabling the observation of interaction dynamics under semi-realistic conditions.

The core of the information environment was Mastodon, a decentralized social media platform that allowed participants to publish, respond, and escalate content in a sandboxed setting (Bergh, 2023). The platform functioned as a controlled hybrid media environment in which communication dynamics emerged through interaction rather than through centrally scripted messaging.

Actors included institutional profiles, anonymous accounts, and hybrid communicators combining elements of ambiguity, irony, or mixed identity signals. This configuration reflects the heterogeneous and contested nature of communication in hybrid media systems, where attribution and intent are often uncertain (Chadwick et al., 2015).

The study adopts an analytical approach aimed at identifying communicative mechanisms and patterns rather than producing statistically generalizable findings.

Data sources

The primary dataset consisted of open-text social media content (posts, replies, threads) generated by participants during the exercise, collected from a closed-instance Mastodon environment. These interactions were authored by institutional profiles, anonymous accounts, and hybrid communicators designed to reflect the ambiguity of real-world influence operations.

In addition to the textual corpus, the dataset included time-stamped metadata (e.g., thread depth, temporal sequencing, hashtag usage), audiovisual content disseminated by factional actors, and structured observation logs compiled by the EXCON analysis team. Data collection combined automated extraction with manual validation to preserve interaction structures and ensure internal consistency.

All data collection adhered to ethical standards established for simulated training environments and was restricted to internal simulation content, without real-world identifiers.

The analysis distinguishes four units of observation: messages (individual posts), threads (reply sequences), narratives (recurring thematic patterns across interactions), and actors (institutional, anonymous, hybrid). This distinction allows the analysis to differentiate between individual communicative acts, interaction structures, actor behaviour, and higher-level meaning formation. Communication on the Mastodon platform generated heterogeneous patterns of engagement, amplification, and fragmentation through participant interaction.

Analytical toolkit

A combination of custom-built and open-source tools was employed to analyse the data in real-time, with a focus on interpretability and analytical responsiveness under the tempo of training conditions. The analysis combines computational processing, network-based analysis, and qualitative interpretation in a triangulated approach to identify communicative patterns across multiple levels of interaction, prioritizing pattern identification over statistically inferred relationships. This multi-method approach was designed to operationalize the analytical dimensions introduced in Section 2 and to enable their observation across different levels of interaction.

Sentiment analysis, supported by LLM-based models, was used to identify emotional polarity and dominant affective markers (e.g. anger, trust, irony). These outputs were treated as heuristic indicators rather than precise psychological measurements.

Social Network Analysis (SNA) was employed to reconstruct interaction structures, identifying central actors, clusters, and bridging nodes. The analysis prioritized visual and interpretive insights into network dynamics rather than formal statistical modelling.

Qualitative coding was applied to textual and audiovisual content to capture rhetorical strategies, symbolic elements, and non-verbal cues, enabling the integration of narrative, affective, and symbolic dimensions.

Key analytical dimensions, including emotional polarity, informational density, temporal relevance, and strategic ambiguity, were operationalized through a combination of qualitative indicators (e.g. linguistic markers, interpretive ambiguity, identity signals) and lightweight quantitative proxies (e.g. message structure, timing, interaction patterns), ensuring consistency across methods; further methodological details and the full coding framework are provided in the Supplementary Material. Engagement and escalation were assessed through interaction patterns such as reply volume, thread depth, and divergence.

To complement the digital analysis of textual interactions, a structured manual protocol was developed to evaluate the audiovisual content disseminated by factional actors. This component of the analysis aimed to capture the symbolic, affective, and rhetorical dimensions of video-based communication, considered key elements in this simulation's cognitive environment.

Each video was coded using a predefined observation grid that integrated semiotic principles (Danesi, 2004), enabling systematic interpretation of visual and performative features. The coding scheme focused on three dimensions: tone and rhetorical structure, ranging from institutional communication to parody or emotional appeals, non-verbal cues, such as body language, facial expression, prosody, and delivery rhythm, and symbolic content, notably uniforms, spatial framing, visual background, and emblematic elements, used to encode factional identity or emotional resonance.

Analytical strategy

Key analytical constructs were operationalized through a set of observable indicators. Strategic ambiguity was identified through the presence of hybrid or unclear identity signals, multiple potential interpretations (e.g., irony or satire), and delayed or contested attribution. Engagement was measured through reply volume, thread depth, and interaction speed, capturing the intensity and responsiveness of communicative exchanges. Escalation dynamics were assessed through increases in emotional intensity, divergence within reply structures, and the emergence of adversarial sub-threads. Network position was derived from Social Network Analysis (SNA) indicators, including centrality, clustering, and bridging roles within the interaction network. Overall, the analytical approach relies on triangulation across computational outputs, network structures, and qualitative coding, allowing the identification of consistent patterns rather than statistically inferred relationships.

Methodological constraints and scope

The research was constrained by the tempo and priorities of the operational nature of the training environment. The research team did not control content creation, inject timing,

or participant behaviour. While these conditions limit experimental control, they also constitute a key strength of the design, as they allow the observation of communicative dynamics as they emerge under conditions of uncertainty and interaction. Findings should therefore be understood as analytically grounded and context-specific, with an emphasis on identifying mechanisms and recurring patterns rather than producing statistically generalizable results.

The multi-method approach enables the capture of complex communicative dynamics but introduces a degree of interpretive subjectivity, particularly in the assessment of ambiguity and rhetorical features. In addition, the simulation environment, while designed to approximate realistic conditions, remains a bounded setting shaped by training objectives and participant variability.

The embedded position of the researchers enhances contextual understanding but implies situated interpretation, consistent with interpretive and embedded research approaches (Czarniawska, 2007; Kawulich, 2005).

Overall, the study provides a structured yet context-sensitive analysis of communicative dynamics, offering an exploratory and analytically grounded contribution focused on identifying recurring patterns rather than producing statistically generalizable claims.

Findings

This section presents the main findings of the analysis of the 15-day simulation conducted during *Mare Aperto 2025*, focusing on recurring communicative patterns observed across message characteristics, actor behaviour, and interaction dynamics. The analysis follows the operational definitions introduced in section 3, where messages, threads, actors, and narratives are treated as distinct units of analysis. Observed patterns are derived from a combination of interaction metrics (e.g., thread depth, reply volume, response timing), sentiment scoring, and network structure. Across all dimensions, patterns of emotional activation, interactional escalation, and ambiguity-driven disruption emerged as recurrent features shaping communicative outcomes.

Narrative dynamics and emotional trends

During the exercise, over 2,000 textual interactions between Blue and Red Team participants were produced, including posts, replies, and nested thread discussions, which were analysed as individual communicative units. Two recurrent communicative profiles were identified: while the blue team predominantly employed a consistent message with sequential messages and sub-messages with an institutional base of legitimacy, unity, and order, the red team, on the other hand, displayed communication patterns that were characterized by fragmented and adaptive interaction structures, combining irony, satire, and ambiguity across multiple threads. These elements contributed to the destabilization of the dominant narrative frame and increased variability in response patterns.

Sentiment analysis highlighted this divergence. Blue Team content, with a mean 6.7 on a 0–10 sentiment polarity scale, presented a consistently neutral to positive emotional register, most frequently associated with trust or confidence and operational composure. Red Team content averaged 4.1, and often involved sarcasm, antagonism, or ambiguity.

Three periods of heightened narrative tension were identified as additional evidence of this divergence: the M.A.R.E. Summit, a fictitious international event where competing narratives of diplomatic legitimacy emerged; a simulated IED threat, triggering speedy speculation and competing narratives; and the “*Gattopardo*” campaign, an anonymous influencer movement that initiated a high-powered satirical counteroffensive against the Blue Team authorities. Across these episodes, Red Team interventions were frequently associated with increased fragmentation of interaction threads and the emergence of competing narrative frames.

Looking at the temporal trends, observations indicate that the Red Team actors actively took advantage of scheduling vulnerabilities. Disinformation and emotionally laden posts were published when the Blue Team was engaged in briefings or operational meetings, resulting in asymmetries in message visibility and early-stage interaction. Halfway through the exercise, the Blue Team detected this pattern and adapted by maintaining continuous communicative presence and issuing reactive counter-messages. While this adaptation did not eliminate disruptive dynamics, it reduced response latency and partially narrowed the visibility gap. This pattern is consistent with the proposition that continuous monitoring and real-time analytical feedback may support faster interpretation and response in dynamic communication environments.

The interaction between emotional polarity, informational density, and timing was decisive for triggering interaction chains. Posts that were emotionally explicit, concise, and temporally aligned with unfolding events were more likely to generate high engagement, measured through reply volume and thread depth. In contrast, longer and more informationally dense messages produced slower and more limited interaction. While not constituting formal experimental proof, these observations are consistent with P1, suggesting that communicative impact is shaped by the interaction between emotional intensity, informational density, and temporal relevance rather than informational completeness alone.

Thread behaviour, escalation, and polarization dynamics

A second layer of analysis focused on reply threads, defined as sequences of interaction originating from an initial message and capturing patterns of amplification, contestation, and escalation.

Blue Team threads predominantly followed linear interaction patterns, characterized by sequential replies reinforcing or clarifying the original message, with limited branching. In contrast, Red Team threads frequently developed into multi-branching structures, where a single post generated multiple parallel reply chains. These sub-threads often exhibited increasing emotional intensity and divergence in content, reflecting processes of amplification and narrative fragmentation.

The polarization phenomenon was particularly evident in threads initiated by ambiguous or satirical messages. Such messages were more frequently associated with interaction chains characterized by rapid tone shifts and factional alignment. In many cases, threads followed a recurrent interaction pattern: an initial provocative or ambiguous message, a defensive or ironic response, escalation into adversarial exchanges, fragmentation into parallel sub-threads. Thread saturation typically occurred within the first 60

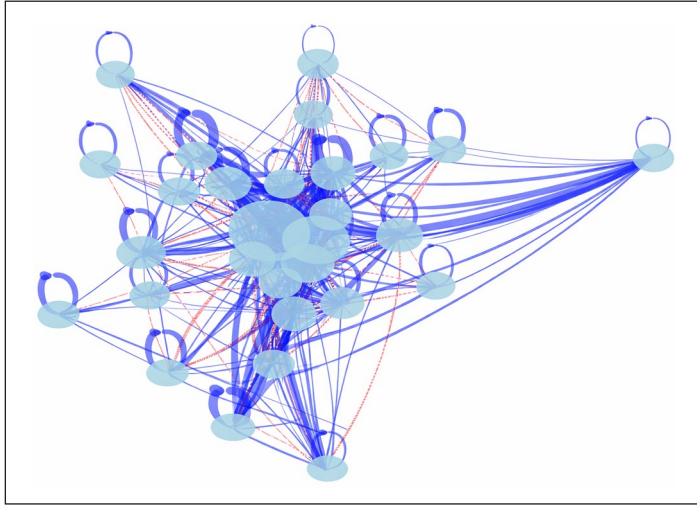


Figure 1. Anonymized communication network during the exercise. Nodes represent actors; edges represent interactions. Blue solid ties (shown as solid lines in grayscale) and red dashed ties (shown as dashed lines in grayscale) indicate different communication dynamics (e.g., alignment vs divergence). Node size reflects interaction volume.

minutes, with high-engagement threads exceeding 40 replies and, in some instances, these interaction patterns displayed clustering tendencies resembling micro-level echo chambers.

These observations suggest that thread dynamics are shaped less by the informational content of the initial message and more by subsequent interactional processes, including emotional amplification and the presence of ambiguity, which enables multiple interpretations, and contributes to divergence in interaction patterns.

Network topology, hybrid actors, and influence pathways

The simulated social network environment also permitted the reconstruction of the interaction network topology, based on replies, mentions, and shared hashtags. Using SNA, the study examined patterns of connectivity, clustering, and actor positioning.

Figure 1 presents an anonymized subgraph centred on a key Blue actor. Nodes represent individual actors, while edges capture communication exchanges. Edge colours indicate factional affiliation (Blue vs Red), enabling the observation of cross-faction interaction patterns.

The Blue Team network displayed a classic centralized architecture, with a small number of institutional accounts acting as stable hubs. These nodes supported the official narrative, but were also structurally exposed, as their visibility made them focal points for contestation during high-intensity phases. The Red Team structure appeared to be a more distributed and modular network, with semi-anonymous or hybrid nodes

contributing to message circulation. This configuration was associated with greater persistence of interaction flows under counter-messaging conditions.

A key finding concerns the role of hybrid and ambiguous actors. Some accounts did not display stable identity signals, combining neutrality, irony, or partial alignment with different positions, and were therefore categorized as hybrid based on unstable attribution and ambiguous communicative positioning. These actors frequently occupied bridging positions, as indicated by higher betweenness centrality between otherwise separate clusters, facilitating the circulation of messages across interaction groups. Their ambiguous framing contributed to increased complexity in attribution and interpretive variability, which was reflected in reduced coherence of responses across interaction threads. The presence of these actors was also associated with blurred factional boundaries and increased uncertainty in message attribution.

Network analysis also revealed diffusion pathways through which messages spread across clusters, sometimes reinforcing internal cohesion and in other cases generating cross-cluster escalation. While quantitative metrics (e.g., centrality) were computed, the analysis primarily relied on interpretive identification of clusters, bridging positions, and fragmentation patterns. These patterns are consistent with P2, suggesting that actors with ambiguous identity signals are more frequently associated with divergence and escalation within interaction networks.

The Jules Horse disruption: Narrative dissonance by design

A distinctive case illustrating these dynamics was the account “Jules Horse”, deployed by the Blue Team as a hybrid actor characterized by ambiguous identity signals and stylistic cues. Its content was semi-poetic, occasionally cryptic, and intentionally satirical. Over time, the account generated sustained engagement while remaining unaligned in appearance, misleading both factions and observers. The strategic ambiguity of Jules Horse was associated with patterns of disruption, including in delayed attribution, cognitive friction, and narrative displacement. It frequently redirected attention away from core messages and triggered reaction threads characterized by confusion, irony, and ideological divergence.

Notably, some of the most effective disinformation tactics employed by Jules Horse were constructed using input from actual EXCON injections, transforming official scenario cues into exaggerated or inverted posts. The account repurposed elements derived from EXCON injections into satirical or distorted narratives, creating feedback loops between the simulated environment and the communicative layer. During the second part of the training, the civilian participants were involved in a complementary and additional load through wargaming injections from The Home Front (Pantaleo, 2025) increasing the density and complexity of the communication environment. Within this context, Jules Horse repurposed war game-derived material into disruptive cognitive and communicative content, illustrating a form of feedback contamination between the simulated environment and its narrative layer. When attribution was clarified later in the simulation, interaction patterns associated with the account had already contributed to thread divergence and variability in emotional intensity.

The case is consistent with both P1 and P2, illustrating how ambiguity in both message construction and actor identity was associated with increased engagement, delayed interpretation, and interactional divergence.

Discussion

The findings of this study support the claim that, in hybrid media environments, strategic ambiguity can work not only as a protective communicative resource but as an active communicative mechanism shaping cognitive disruption, and the integration of strategic ambiguity theory with the dynamics of hybrid media environments allows us to understand how specific communicative effects are generated in mediated conflicts. The findings are consistent with the three analytical propositions advanced in this study and address the gap identified in previous academic literature concerning how ambiguity works in polarized but interconnected environments where attention, narrative struggles, and platform logics determine what becomes salient (Chadwick, 2011; Chadwick et al., 2015).

Findings are consistent with P1, suggesting that emotionally salient and temporally aligned messages generated higher engagement. This is consistent with the idea that emotional activation becomes particularly effective when combined with interpretive openness typical of ambiguity (Chadwick, 2011; Gilardi et al., 2022). In *Mare Aperto 2025*, the most disruptive messages were not simply negative or provocative: they were also concise, temporally well-positioned, and sufficiently ambiguous to invite multiple readings. This suggests that engagement in the cognitive dimension of conflict is shaped not only by emotion, but by the interaction between affective intensity and ambiguity. This study is consistent with prior research showing that ambiguity is a strategic resource that allows organizations and institutions to sit in a grey area, where they can preserve deniability, hold together divergent audiences, and protect actors operating under incompatible expectations (Cappellaro et al., 2023), while also increasing portability across communicative contexts. Because ambiguous messages can be interpreted differently by institutional actors, informal participants, ironic communicators, and oppositional publics, they travel more easily across heterogeneous media logics (Chadwick, 2011).

Second, the findings are consistent with P2, according to which actors displaying ambiguous identity signals are more likely to generate divergence, escalation, and interpretive conflict than clearly attributed actors. This is reflected both by the broader network analysis and by the specific case of Jules Horse. Accounts combining unstable identity cues, irony, hybrid positioning, or partial anonymity were frequently associated with delayed attribution, bridging roles across clusters, and higher levels of thread fragmentation. This result is consistent with previous research on the dynamics of hybrid media environments, which locate power not only in message production, but in the ability to redirect information flows across interconnected communicative arenas (Chadwick, 2011; Jungherr et al., 2019). In such environments, actors do not need stable authority to become influential since they benefit from being sufficiently visible to trigger engagement while remaining sufficiently indeterminate to avoid quick categorization. This insight supports the argument that ambiguous actors are structurally advantaged in hybrid media systems because circulation and reframing matter as much as origin or formal

credibility (Chadwick et al., 2015; Gilardi et al., 2022). What earlier literature describes as strategic ambiguity in diplomacy or covert action becomes, in the cognitive dimension, a mechanism contributing to what can be described as cognitive fog: uncertainty about who is speaking, with what intent, and under what alignment. The findings suggest that ambiguity not only allows the postponement of interpretive closure (Eisenberg, 1984), but it can actively produce fragmentation and escalation by making attribution itself part of the contest.

The Jules Horse case shows the dynamics of destabilization of interpretative conditions. Its semi-poetic and satirical style, and unclear factional alignment redirected attention away from dominant narratives and created ambiguity before attribution was clarified (Cappellaro et al., 2023). Our findings show that such dynamics can emerge even within a controlled exercise environment, suggesting that ambiguity is not an accidental byproduct of digital contestation but a reproducible mechanism of communicative disruption.

Lastly, with regards to P3, the adaptation of the Blue Team following the identification of vulnerabilities suggests that real-time analytical feedback can support more responsive and coordinated communication in mediated conflict. Once continuous monitoring reduced response latency and narrowed the visibility asymmetries, disruptive effects did not disappear, but their intensity was partially mitigated. This is coherent with the idea that sentiment tracking, interaction mapping, and quick interpretive analysis can be leveraged as forms of cognitive situational awareness (Du Cluzel, 2021; NATO, 2023; Stato Maggiore della Difesa, 2023). However, the study's findings show that real-time feedback could not restore interpretive control once ambiguity-driven dynamics had already taken hold. This is an important result because it suggests that cognitive situational awareness is necessary but not sufficient to translate into communicative dominance.

Considering the findings of this study, the *Mare Aperto* exercise suggests that cognitive effects emerge from mediated interaction in which attention, trust, emotional activation, and attribution are continually contested.

Conclusion and recommendations

The *Mare Aperto* exercise offered a valuable opportunity to examine how cognitive effects emerge through communication in a simulated operational environment. By combining a simulated social media platform with live analytical tools, the exercise showed that contemporary conflict unfolds not only through coercive force, but also through struggles over attention, interpretation, and attribution. Communication therefore appears less as a secondary support function than as a consequential arena of strategic contestation. The study's central contribution is to show that strategic ambiguity can function as a mechanism that structures attention, sustains engagement and destabilizes attribution in hybrid media environments. Rather than merely shielding actors through deniability or flexibility, ambiguity can also shape the communicative conditions under which audiences interpret events and evaluate actors. Influence in mediated conflict thus depends not only on persuasion or falsehood, but also on the ability to maintain uncertainty, trigger reaction and delay interpretive closure.

The findings further suggest that communicative effects are produced through the interaction of message features, actor positioning, and platform dynamics. Messages combining emotional salience, brevity, and temporal relevance gained disproportionate visibility, while actors marked by unstable or unclear identity cues were more likely to generate fragmentation and contestation. At the same time, analytical monitoring appeared to improve responsiveness and coordination, although only partially once disruptive dynamics had already become established. Cognitive disruption should therefore be understood as an emergent outcome of mediated interaction.

These insights carry practical implications for state actors and organizations engaged in crisis communication. First, they indicate that StratCom can be understood as an operational form of influence shaping perceptual environments and informational asymmetries. Second, they highlight the need for training formats addressing ambiguity, emotional escalation, attributional uncertainty and communicative speed rather than focusing narrowly on message production alone. Third, they point to the growing relevance of cognitive situational awareness, including the capacity to monitor information flows, detect narrative shifts and rapidly coordinate responses.

At the doctrinal level, the findings suggest that future capability development may need to integrate communication more explicitly into operational planning. This includes an understanding of how narratives circulate, mutate and are contested across hybrid media environments. Exercises such as *Mare Aperto* can serve as useful test beds for refining such approaches.

Several limitations should be acknowledged. As an exercise-based simulation, the study relied primarily on behavioural indicators rather than direct audience surveys or experimental control. The findings are therefore analytically grounded rather than universally generalizable. At the same time, this setting offers particular value because it captures communicative dynamics under time pressure, incomplete information, and contested meaning.

Future research should test whether similar ambiguity effects emerge across other exercises as well as during crises and live conflicts. Further work could also identify which linguistic or visual forms of ambiguity are most disruptive across different communicative contexts.

Overall, the *Mare Aperto 2025* exercise suggests that contemporary conflict outcomes increasingly depend not only on the ability to act, but also on the ability to interpret and communicate effectively in contested cognitive environments.

Authors' note

UN Strategic Relevance: this study contributes to the advancement of UN SDG 16 – Peace, Justice and Strong Institutions – by strengthening cognitive resilience, institutional transparency, and preparedness against disinformation in complex operational environments.

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AI-based tools were used to support specific analytical tasks (e.g., sentiment detection and pattern identification) and to assist in language refinement. All conceptualization, interpretation of results, and analytical decisions are the responsibility of the authors.

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Ethical considerations

This study was conducted within the context of a controlled military training exercise (*Mare Aperto 2025*). All data were generated in a simulated environment and did not involve real-world personal data, identifiable human participants, or human tissue. Formal ethics approval was therefore not required for this research.

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Data availability statement

All data analyzed in this study were generated within the simulation environment. Due to institutional, operational, and security constraints, raw data cannot be made publicly available or shared with external parties.

Supplemental material

Supplemental material for this article is available online.

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