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ARTICLE

Content Analysis of Media-Based Public Health Communication in Global Humanitarian Crises

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Abstract

This study applied Technology–Organization–Environment (TOE) framework, together with ANT, through the lens of Design Science Research Methodology (DSRM) to examine the fragmented methodological landscape in media-based public health communication during global humanitarian crises. The technological dimension encompasses digital platforms and data analytics; the organizational dimension highlights leadership readiness and institutional structures; and the environmental dimension captures socio-political contexts and cultural norms. ANT complements TOE by uncovering the interplay between human and non-human actors in shaping communication flows. A chi-square analysis was performed to empirically assess the frequency and reliance on different information sources among media channels communicators, revealing significant variation across regions and method types. The resulting framework provides a structured yet adaptable pathway for future research and policy development, supporting more coherent and context-sensitive public health communication strategies in crisis settings.

Keywords: Public Health Communication; Global Humanitarian Crises; ICT; Media Content Analysis; Technology–Organization–Environment (TOE); Actor–Network Theory (ANT); COVID-19 Campaigns

1. INTRODUCTION

This study focuses on the content analysis of media-based public health messaging, examining how different media channels traditional and digital convey health information in the period of major public health crisis. It explores the intersection of communication strategies, technological affordances, and sociopolitical environments that influence message design and reception. The rise of social media has introduced new dynamics, including real-time engagement, misinformation, and artificial intelligence algorithmic amplification, which complicate the landscape of crisis communication [1]. The intentional use of mass and digital media platforms to disseminate health information, shape public opinion, and promote healthier habits among a variety of local and global populations has evolved into media-based public health communication [2]. By analyzing media content through structured frameworks, this research aims to identify patterns, gaps, and best practices in public health messaging. It also considered the role of cultural sensitivity, language accessibility, and community engagement in enhancing message impact. The study seeks to inform the development of resilient, adaptive communication systems that can better serve diverse populations during global emergencies. Through this lens, media becomes not just a conduit for information, but a strategic tool for public health strong determination, equity and social

justice [3]. Global health communications are shaped by technological advancement, cultural diversity, and varying levels of infrastructural development that necessitated healthcare information access across different systems [4]. Effective communication ensures accurate information exchanges among healthcare providers, policymakers, and the public, particularly during health contingencies. Analyzing international communication practices requires a flexible and methodologically diversified toolkit, particularly in the dynamic and high-stakes healthcare industry [5].

The deliberate use of traditional and digital media platforms to spread accurate, culturally sensitive, and easily accessible health information with the goal of influencing behaviors, fostering trust, dispelling false information, and encouraging group action during public health emergencies is known as media-based public health communication [6]. In this sector, the way healthcare information is communicated, received, and used is influenced by a combination of linguistic subtleties, cultural context, technology innovation, and legislative changes [7]. A systematic categorization of research methodologies that can map, quantify, and interpret changes across systems and time is necessary to comprehend the evolution of these communication practices. Descriptive observation alone is insufficient because, beyond the conventional boundaries of doctor-patient interactions, communication in the healthcare industry has grown to include telemedicine, social media engagement, multilingual health education, global health diplomacy, and collaborative international research on disease surveillance and healthcare management [8]. Focusing on critical objectives that enhance the healthcare system for all citizens of every nation is essential, especially by reducing the death rate from infectious diseases. The vulnerability and resilience of our international health communication networks were brought to light by COVID-19 [9]. On the other hand, the world witnessed unprecedented cross-border cooperation as governments, public health organizations, and scientists shared data, guidelines, and research almost instantly. However, the crisis also revealed serious communication breakdowns: important health directions were muddled by uneven messaging, public trust was strained, and misinformation spread quickly [10].

Enforcing healthcare information communication technology (HICT) regulations that support secure communication protocols and standardized public governance across digital health platforms improves interoperability and protects institutions public image. By improving public health communication, these mandates create a strong, intelligent, and transparent health data ecosystem that facilitates evidence-based decision-making, increases the effectiveness of healthcare delivery, and gives stakeholders timely, trustworthy insights to improve population health outcomes and build confidence in digital health systems. By enhancing information flow across various components of the health system through electronic methods, information and communications technology (ICT) offers the potential to help realize these concepts [11]. ICT integration into health systems can enhance information exchange between various health system components and non-health industries. ICT promotes cooperation between allied fields like education, emergency response services, and social services in addition to the health sector. Cross-sectoral information exchange is essential during pandemics and other public health emergencies. ICT platforms allow for more comprehensive and coordinated responses by connecting disease monitoring data with emergency management systems, school attendance logs, and transportation records [11]. For instance, digital dashboards can notify government organizations about regions in need of immediate medical supplies or action, and health alert systems connected with mobile networks can broadcast targeted messages to the general populace. ICT also helps international health initiatives by facilitating uniform data collecting and reporting among nations. The World Health Organization (WHO) and other international organizations can compare health indicators, track disease outbreaks, and evaluate policy outcomes globally by using standardized platforms [12]. Tracking progress toward the Sustainable Development Goals (SDGs) relating to health and maintaining accountability depend on such skills. Multilingual and culturally sensitive communication is another important benefit of ICT [13]. Health literacy and user engagement can be enhanced by adapting web-based portals and mobile health apps to various linguistic and cultural contexts. Personalized health advice can also be provided via voice assistants and chatbots powered by artificial intelligence and natural language processing particularly in areas with a shortage of human resources [14]. ICT essentially serves as the glue that holds together contemporary health systems, tying together organizations, technologies, and individuals across sectoral and geographical divides. Its integration promotes more inclusive, data-driven, and cooperative global health communication in addition to increasing the

velocity and accuracy of information flow. Leveraging ICT will be crucial for creating robust and equitable healthcare systems globally as digital infrastructure grows.

Digital communication gained prominence as a result of the epidemic, which made telemedicine, mobile health apps, and artificial intelligence-powered diagnostics go from being cutting-edge inventions into essential components of modern healthcare [13]. Meanwhile, Twitter, Facebook, WhatsApp and every social media metamorphosed into battlefields where trustworthy facts and misinformation coexisted. In order to engage diverse people and combat disinformation, health authorities have to quickly adjust and create more flexible, open, and culturally sensitive communication tactics. Of particular interest is the way that COVID-19 compelled a reexamination of not only what we communicate in the health field, but also how and by whom. Digital media's direct effects on society suggested that we are at the beginning of a new era of extreme automation, characterized by internet of things, which could lead to a paperless society where all media are created and used on digital devices. When it comes to communication, the digital media have some profound, wide-ranging, and complex effects on the philosophy and civilization of the present digital natives. Personal computers, cellphones, personal digital assistants, and other handheld computing devices have logically commanded the ability to access, process, alter, save, and transport digital media material in the hands of billions of people. Digital media communication revolutionized the way information was shared, care was provided, and communities were involved, which was crucial in controlling the COVID-19 health crisis and sustaining global education business [13]. Electronic and social media channels emerged as vital conduits for situational awareness and public health messaging, enabling governments, health organizations, and communities to share critical updates in real time. They were utilized by governments and health organizations to dispel myths, encourage preventive actions, and exchange real-time updates. Digital media not only helped the COVID-19 response, but it also changed the way that global health communication is organized. It demonstrated how digital tools, when applied carefully, can improve public health systems' responsiveness, equity, and resilience [15].

Global health studies emphasize a change from treatment to prevention, surveillance, and management by offering multidisciplinary approaches to diseases prevention [1]. By promoting preventive diseases approaches, raising awareness of surveillance systems, and normalizing multidisciplinary methodologies to disease prevention, modern-day media platforms upend conventional health narratives. Communities are encouraged to prioritize prevention over treatment through social media campaigns, digital storytelling, and interactive communication tools that change cultural perceptions of health. This disruption democratizes information access, enabling a variety of groups to interact with global health strategies and modify them for local settings. In the end, communication and the media serve as catalysts for cultural change, promoting accountability, transparency, and group responsibility while integrating preventive health practices into daily life. The main goal is to encourage everyone to be healthy in order to build a community with a common future for all people. This developing idea has been at the center of conversations at conferences, workshops, and academic forums due to developments in research, instruction, policy, and implementation [16]. Maternal and child health, environmental health, health disparities, interventions, and the prevention of infectious and non-communicable diseases are important areas of global health policy interventions [17]. In order to address these issues, health equity must be acknowledged and promoted on a national and worldwide level. The remaining part of this paper is structured into: Background of the Study, Research Questions, Theoretical Framework, Literature Review, Study Hypothesis, Research Design, Research Methodology, Discussion of Research Findings, Study Recommendation and Conclusion.

2. Background of the Study

This study offers a systematic categorization of research methodologies for examining how global communication practices have changed over time, especially in the ever-evolving field of health communication. It is based on the Technology–Organization–Environment (TOE) framework that looks at how methodological approaches to communication research are shaped by external contextual influences, institutional preparedness, and technological breakthroughs. The emergence of digital tools like social media, telemedicine, and interoperability standards like Fast Healthcare Interoperability Resources (FHIR), all of which call for flexible research approaches are highlighted by the technological

dimension. The organizational component takes into account how public agencies, academic institutions, and healthcare providers apply these strategies in light of their internal resources and communication objectives. The environmental context, on the other hand, represents intercultural variety, global health concerns, and governmental mandates that impact data accessibility and research goals. It uses design science research methodology (DSRM) to create a theory-based and practical framework. Through the iterative processes of problem identification, objective setting, artifact creation, and evaluation, the research develops a descriptive and prescriptive taxonomy of approaches. By classifying qualitative, quantitative, and mixed-methods approaches, the generated artifact also links them with contextual elements that impact global communication networks. In relation to the DSRM lens, the classification is flexible and can change in tandem with organizational learning and technological advancement. Through the integration of TOE and DSRM, the study offers a thorough and practical ramification for scholars negotiating the intricate landscape of international communication practices.

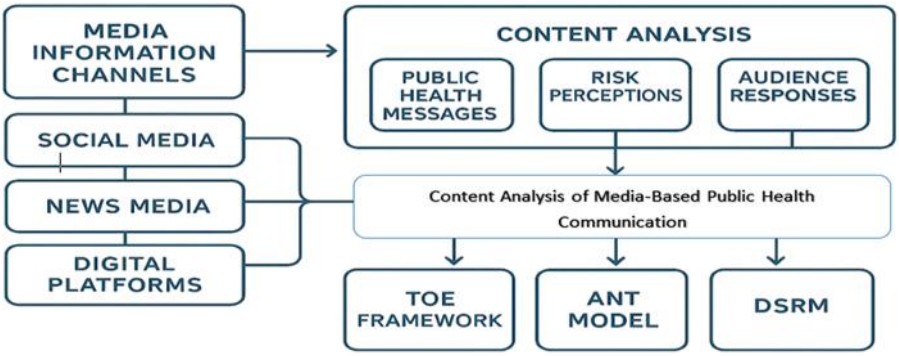

Figure 1. Structural Framework for *"Content Analysis of Media-Based Public Health Communication in Global Humanitarian Crises",* Authors illustration

The framework offers a multidimensional structure to evaluate media-based public health communication in crisis settings. At its base, media information channels capture the broad spectrum of message dissemination from traditional outlets to citizen media. These sources feed into a deeper analysis powered by the TOE framework, which assesses technological tools, organizational dynamics, and environmental constraints shaping the communication landscape. Building on that, the Actor-Network Theory layer maps the relationships between actors such as media platforms, public institutions, algorithms, and individuals. It emphasizes how trust and influence emerge from the interplay among these entities, turning abstract networks into tangible forces of persuasion and impact. Design Science Research Methodology then gives the framework its analytical engine, with structured phases from problem identification to evaluation. This ensures the model isn't just descriptive but actionable, supporting iterative refinement and solution creation. Its presence in the framework signals a commitment to rigor and relevance. Together, the components generate an integrated lens for decoding how health messages are formed, circulated, and received across diverse sociotechnical contexts. The result is a holistic, adaptable system capable of guiding both academic analysis and practical response efforts in times of global humanitarian need.

The Figure 1 presents a coherent and structured classification of research methods situated within the TOE framework, specifically tailored to Content Analysis of Media-Based Public Health Communication in Global Humanitarian Crises. It illustrates how technological innovation, organizational capabilities, and environmental contexts interact to influence both the trajectory of global communication and the methodological choices researchers make when studying it. At the highest level, the three core dimensions of the TOE framework, Technology, Organization, and Environment form the foundational influences. Technology encompasses the tools, platforms, and infrastructures that facilitate ICT and other digital communication on a global scale, such as the internet services, mobile telecommunication networks, cloud computing, and artificial intelligence (AI) [16]. The Environment includes the external forces such as cultural diversity, international policies, competitive pressures, and occasional global crises that shape communication practices beyond organizational control. The TOE

framework's organization component examines internal problems that influence the adoption of media communication technologies. Fastest digital media projects require leadership commitment, personnel readiness, financial investment, and an inventive culture. The decisions made by an organization's executives largely determine its capacity to integrate digital media communication that brings the desired activation. Owners and managers of organizations must have a clear vision and know how digital tools may facilitate communication. Leadership dedication ensures the necessary investments in employee training, digital infrastructure, and the design of a creative culture. A staff with digital competency is necessary to manage data analytics, social media engagement, and AI-driven promotional activities [18]. These three dimensions of TOE collectively inform and shape the central focus of the diagram, prompting the classification of research methods used to study how communication evolves globally. This central box represents the need to systematically explore changes in communication patterns, tools, and behaviors through rigorous academic inquiry. It serves as a bridge between the contextual pressures of the TOE framework and the methodological decisions researchers must make. Emerging from this classification are four methodological approaches: Quantitative, Qualitative, Mixed Methods, and Computational.

Each method offers distinct analytical tools and perspectives, and their inclusion in the framework underscores the importance of methodological pluralism when investigating complex, multifaceted phenomena such as global health communication. Quantitative methods provide structured, data-driven approaches to uncover patterns, relationships, and trends across large datasets. In the context of global communication, this may include the statistical analysis of communication frequencies, message diffusion across networks, or survey-based research on user behaviors. Qualitative methods allow for depth and contextual understanding, capturing the nuances of communication across cultures, organizations, and digital platforms. These may include ethnography, interviews, or content analysis, which are especially valuable when examining the meaning-making processes within specific cultural or organizational contexts. They align closely with the organizational and environmental factors that shape human behavior and interaction. Mixed Methods approaches combine the strengths of both qualitative and quantitative paradigms, offering a more holistic understanding of communication phenomena. For example, a researcher might conduct interviews to interpret survey results, enabling a richer understanding of underlying behaviors or trends. This approach is particularly suitable in complex environments where neither qualitative nor quantitative methods alone provide sufficient insight.

Blending the TOE framework with Actor-Network Theory (ANT) creates a robust, multidimensional lens for analyzing the evolution of global communication practices. TOE categorizes the structural forces that shape method selection technological infrastructure, organizational capacity, and environmental complexity offering a clear, functional framework for mapping contextual variables [19]. ANT, on the other hand, disrupts linearity by emphasizing the organization of both human and non-human actors, revealing how technologies, platforms, policies, and researchers co-construct the communication landscape through negotiation and alignment. This hybrid approach bridges macro-structural analysis with micro-relational dynamics, offering a top-down view of technological capabilities, organizational readiness, and environmental conditions that set the stage for how communication practices evolve. In the study of global communication, this integrated lens captures the fluid interplay between structure and organization, system and network. Computational methods represent a newer, rapidly expanding domain of research. Leveraging big data, natural language processing, machine learning, and social network analysis, computational approaches allow researchers to analyze massive volumes of digital communication data [11]. These methods are especially relevant in technologically advanced and globally connected environments, enabling real-time analysis of communication across digital platforms. By situating the classification of research methods within the TOE framework, the diagram emphasizes that the evolution of global communication practices cannot be understood in isolation. It must be examined in light of technological innovations, organizational readiness, and environmental influences, all of which shape both communication itself and the tools scholars use to study it. Technological advancement, sociopolitical upheavals, and the growing interconnectedness of global health systems which are typified by extreme HICT, in which data, devices,

and decision-making are seamlessly connected across institutions and care settings have all had a significant impact on the evolution of global communication [11].

Traditional broadcast media and physical interactions were the mainstays of healthcare communication in the past, which was primarily localized [20]. But the rise of digital platforms, real-time data sharing, and global public health networks have changed the way that messages about health are created, disseminated, and accessed. Worldwide emergencies, like the COVID-19 pandemic, have speed up these changes by highlighting the strengths and weaknesses of global communication networks [21]. HICT includes clinical decision support systems, electronic health records (EHRs), telemedicine platforms, distributed healthcare information systems, general healthcare infrastructures, and secure data-sharing networks [15]. It investigates how communication methods transform over time through the interplay of technological advancements, organizational capabilities, and shifting environmental dynamics. By acknowledging both human and non-human actors as influential forces, this study seeks to map methodological diversity as a function of evolving global contexts. The objective is to support more responsive, inclusive, and context-aligned communication research in a digitally interconnected and rapidly changing world. A more complete picture of how communication changes over time and across settings is made possible by mixed-methods designs, which have gained popularity because they can balance numerical trends with contextual insights. A systematic categorization of various research techniques is becoming more and more necessary, necessitating researchers to adopt approaches that are not only adaptable and context-aware but also rigorous and reproducible as they address issues related to audience trust, message credibility, and information accessibility. However, the literature now in publication frequently discusses various approaches separately, lacking a cohesive framework that would enable methodical comparison and use. The goal of this study is to close that gap by offering a thorough classification scheme for research techniques applied to the examination of changing international communication patterns. It bridges the gaps in current typologies and expands on earlier research in information science, public health, and communication theory. By aligning approaches with global health priorities and communication issues, the research not only advances academic knowledge but also offers useful advice for international organizations, policymakers, and health communicators negotiating a more complicated information environment.

3. Research Questions

There are five structured research questions tailored to this study, with a strong theoretical grounding and practical relevance:

RQ1: How do different media platforms (e.g., social media, radio, television) influence the dissemination and reception of public health messages during global humanitarian crises?

RQ2: In what ways do technological, organizational, and environmental factors (as defined by the TOE framework) shape the selection and effectiveness of communication strategies in crisis settings?

RQ3: How do human and non-human actors (as conceptualized by Actor–Network Theory) interact to co-construct public health narratives and influence message credibility during emergencies?

RQ4: What role does cultural sensitivity and language accessibility play in enhancing the impact of media-based public health communication across diverse populations?

RQ5: To what extent do mixed-methods approaches improve the accuracy, adaptability, and contextual relevance of content analysis in global health crisis communication research?

4. Theoretical Framework

To construct a robust theoretical framework for categorizing research methodologies that examine the evolution of global communication practices, this study integrates the TOE model with DSRM and ANT. This combined approach enabled a structured yet dynamic analysis by aligning contextual factors with methodological design and tracing the relational interplay among human and non-human actors influencing global communication. The technological part of the TOE encompasses advancements that change communication environments, such as telemedicine, mobile platforms, and interoperability standards [22]. Based on internal structures, digital preparedness, and strategic objectives, the

organizational component looks at how institutions implement research initiatives. In the worldwide communication dynamics that resulted in the management of COVID-19, the environmental context includes cultural diversity, regulatory requirements, and crisis situations that affected the methods of selection and adaptation of emergency responses. By using DSRM, a methodological categorization framework can be systematically created as a research artifact. This study creates an adaptable taxonomy through phases of iterative design, assessment, and refinement that match research methodologies with the changing communication requirements of international health systems.

In order to help academics and professionals navigate the intricate development of international communication practices, this integrated approach guarantees that the framework is both theoretically sound and practically applicable. A multifaceted theoretical perspective is necessary to comprehend the growth of global communication practices, especially in settings as complicated and high-stakes as healthcare. In order to create a theoretical framework that can direct the categorization and use of many research methodologies, this study synthesized communication theory, systems theory, and methodological pluralism. Communication systems theory, which holds that communication is a dynamic process embedded within and impacted by larger social, political, and technological surroundings, forms the foundation of any subject matter [23]. Rather than moving in a straight line, communications in global health communication are filtered, transformed, and reinterpreted as they move via different nodes, including institutions, individuals, media platforms, and governments.

The way health information travels across national boundaries and institutional boundaries, as well as how feedback loops impact communications tactics over time, are all contextualized by this theory. The diffusion of innovations hypothesis, which focuses on how new communication practices and technology are embraced, modified, or opposed in various sociocultural contexts, is a useful addition to this. One example of how innovations spread unevenly across settings is the COVID-19 pandemic's quick adoption of digital health tools like telemedicine and mobile health applications [24]. Researchers can use this paradigm to examine how communication practices are adopted and changed in various international contexts. Recognizing that no single study method is enough to fully capture the complexity of global communication evolution, the framework integrates multiple approaches in order to promote methodological classification. In reality, quantitative methodologies like network analysis, sentiment evaluation, and statistical modeling provide empirical generalizability and cross-national comparability, while qualitative approaches like ethnography, content analysis, and discourse analysis reveal profound cultural and contextual meanings [25]. These theoretical stances work together to create a taxonomy of research methodologies that may be used to examine how communication practices change over time and across different regions. The end product is a comprehensive framework that places research techniques within the larger dynamics of digital revolution, sociopolitical change, and global health in addition to classifying them. This framework provides a foundation for future research aiming to manage the opportunities and problems of a more interconnected society by tying theory and technique together. It also enables a more nuanced understanding of the processes driving healthcare communication transformations.

Integrating ANT as a computational agent within the DSRM framework offers a powerful lens for analyzing the evolution of global communication practices [13]. According to Nguyen et al. [26], when applied to DSRM, ANT enables a dynamic mapping of how these heterogeneous actors interact to shape methodological choices and communication outcomes across global contexts. For instance, a social media platform (non-human actant) may influence the methodological preferences of a health communication researcher (human actant), who in turn interacts with institutional review boards, data privacy regulations, and digital analytics tools. ANT allows these interactions to be visualized as evolving networks rather than linear cause-effect chains, aligning well with DSRM's iterative and artifact-driven approach [27]. This perspective enables a more nuanced understanding of causality, where outcomes emerge not from isolated agents but from the interactions and interdependencies across the entire network. In the context of global communication practices, ANT provides a powerful lens for tracing how messages, decisions, and behaviors materialize through complex, hybrid assemblages of humans and machines, rules and tools, goals and constraints [28]. It encourages researchers to map not only who is involved in communication processes, and what roles are performed by the technologies and structures that mediate them.

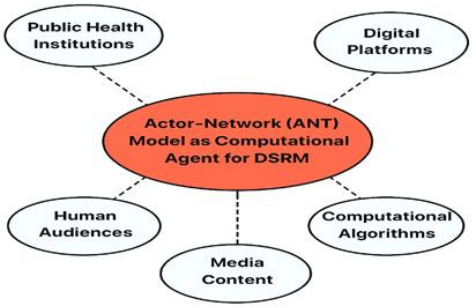

Figure 2. Actor Network (ANT) model as computational agent for DSRM in *Content Analysis of Media-Based Public Health Communication in Global Humanitarian Crises,* author illustration.

To analyze the structural diagram of the ANT model as a computational agent within the DSRM for content analysis of media-based public health communication, we must look at how the interconnected elements interact in both theoretical and operational dimensions. The diagram illustrates a multi-layered network, where human and non-human actors such as healthcare professionals, media algorithms, digital platforms, and policy documents function as dynamic nodes within the ANT framework. These nodes are connected through relational ties, symbolizing influence, dependency, or information flow. By treating ANT as a computational agent, the model enables simulation and analysis of interactions to reveal emergent behavior, message propagation patterns, and stakeholder influence. Within DSRM, the ANT agent supports iterative design activities: problem identification, objective definition, artifact development, demonstration, evaluation, and communication. Each stage draws insights from ANT by mapping actor roles and tracing their impact on public health messaging during crises. The TOE dimensions—Technology, Organization, Environment frame the contextual variables that shape media adoption and use. It emphasizes collaboration across actors, reveals structural dependencies, and supports strategic interventions for crisis communication optimization.

The Figure 2 illustrates how the ANT Model integrates with the DSRM in global communication practices, serving as a central concept in the communication loop. These elements feed into a computational agent, which facilitates the evolution of communication practices. During the problem identification phase of DSRM, ANT helps trace how fragmented methodological practices emerge from disjointed actor-networks, such as isolated academic disciplines, incompatible data infrastructures, or siloed policy environments [29]. In the objective definition phase, ANT supports the articulation of goals that reflect the interests and constraints of multiple stakeholders, including researchers, funders, platforms, and affected communities. In the artifact design phase, ANT's principle of symmetry, treating human and non-human actors with equal analytical weight, guides the construction of a classification framework that accounts for both technological affordances and institutional norms. For example, the inclusion of computational methods in the taxonomy is not merely a reflection of technological progress but also of the agency of algorithms, data standards, and platform governance structures. The demonstration and evaluation phases benefit from ANT's emphasis on translation and negotiation. As the classification framework is applied to empirical studies, ANT reveals how methodological choices are not just technical decisions but outcomes of negotiations among actors with competing interests and capacities [30]. This insight enhances the framework's contextual relevance and adaptability. The communication phase, ANT enriches the narrative by highlighting the networked nature of knowledge production. Rather than presenting the classification as a static tool, it is framed as a living artifact shaped by ongoing interactions among researchers, technologies, institutions, and global events. By embedding ANT within DSRM, the study transcends traditional methodological taxonomies and offers a more nuanced, relational understanding of how global communication practices evolve. This hybrid approach not only strengthens the theoretical foundation of the classification framework but also equips researchers with a flexible tool for navigating the complex, actor-rich terrain of global communication in the digital age.

5. Literature Review

The literature on media-based public health communication during global humanitarian crises reveals a dynamic intersection of technology, information dissemination, and behavioral influence. Studies consistently highlight the pivotal role of media, especially social media in shaping public perception, guiding health behaviors, and facilitating crisis response. Three dominant themes emerge: surveillance monitoring, risk communication, and disease control. Surveillance monitoring involves tracking public sentiment, misinformation, and outbreak patterns through digital platforms. Risk communication focuses on timely, transparent messaging that builds trust and encourages protective actions. Disease control encompasses the strategic use of media to promote behavioral change, such as vaccination uptake or adherence to safety protocols. Social media platforms like Twitter, Facebook, and Instagram have become essential tools for health authorities, enabling rapid information sharing and community engagement. However, challenges persist, including the spread of misinformation, language barriers, and unequal access to digital resources. Studies emphasize the need for culturally sensitive, multilingual content and two-way communication strategies to enhance effectiveness. ANT offer valuable lenses for analyzing how media ecosystems function during crises. TOE helps assess technological capabilities, organizational readiness, and environmental constraints, while ANT maps the relationships among human and non-human actors influencing communication outcomes. DSRM supports iterative, solution-oriented inquiry, ensuring that communication strategies are not only evidence-based but adaptable to evolving crisis contexts. This emphasizes how important it is to classify research methodologies in a thorough, flexible, and context-sensitive manner that is suited to international communication practices.

By grounding this endeavor in the TOE framework, researchers may comprehend the reasons for methodological changes, and DSRM offers an organized approach to methodically create and improve the categorization itself. Together, they provide a strong, dual-theoretical basis for creating a taxonomy that is both empirically supported and useful in practice, ultimately strengthening the ability of academics and professionals to research, evaluate, and enhance global communication systems in a world that is becoming more digital and interconnected. The classification of research methodologies for assessing global communication practices has become a more interdisciplinary field of study, reflecting the intricate relationship between organizational behavior, technology, and environmental factors [31]. Using the TOE framework as a lens for analysis offers a coherent approach to comprehending how research methodologies change in response to digital transformation. The corpus of work, when combined with the DSRM, not only theorizes about the application of methods but also helps develop and assess useful tools, such taxonomies or categorization frameworks, that tackle communication problems in the real world, both before and after the major health sector crisis. Global communication research's thematic synthesis also highlights how crucial interdisciplinary cooperation is in concurrently study of environmental health, epidemic surveillance, and vaccination hesitancy application [32]. When it comes to choosing and using research methodologies, organizational considerations are also quite important. Hospitals, university research institutes, and public health departments' resource capacity, internal organizational structures, and strategic priorities all affect how prepared they are to implement new tools. Digitally established organizations are more likely to conduct methodologically creative investigations, frequently using mixed-methods frameworks to analyze communication both statistically and qualitatively [33]. For example, Mogaji [34] demonstrate how leadership and institutional culture have a big impact on whether research uses more conventional, top-down procedures or incorporates participatory alternatives. In this regard, DSRM serves as a mechanism to design classification systems that are responsive to institutional needs and capable of evolving alongside organizational development.

The demand for methodological innovation has increased as a result of global devastations like the COVID-19 pandemic, changes in health policy, and data privacy laws [35]. Numerous studies demonstrate that the severity and urgency of health emergencies drive researchers to employ real-time data analytics, social media mining, and quick survey approaches [36]. During COVID-19, researchers such as Matthew[13], demonstrated how dynamic communication environments result in the prevalence of mixed methodologies to understand public sentiment, behavioral influence, and message transmission

across various media ecosystems. Classification schemes must take into account contextual relevance, timeliness, adaptability, and methodological rigor in order to satisfy these objectives. The use of DSRM is especially relevant in developing methodological classifications that are both theoretically sound and practically applicable. DSRM emphasizes artifact creation, here the classification system itself as a response to an identified problem or opportunity [37]. It frames the research process as iterative and goal-oriented, encompassing six key stages: problem identification, objective definition, artifact design, demonstration, evaluation, and communication. Applying this model, recent literature has proposed method taxonomies tailored to specific technological contexts or communication domains, although few have sought to integrate these frameworks into a unified, TOE-informed architecture. Emerging studies have begun to bridge this gap, permitting Harrison [38] to advocate for integrated typologies that align research objectives with contextual variables across health systems. They argued that classification models should account for the level of digital infrastructure, data interoperability, and regulatory environments to ensure external validity. In addition, Onyebuchi [39] emphasized that research methods in global health communication must also reflect cultural and linguistic heterogeneity, advocating for classification schemes that include participatory, community-based approaches alongside computational and experimental designs [40].

According to Sandoval-Almazan and Valle-Cruz [41], the role that ICTs play in facilitating data interchange and cross-sectoral collaboration is also becoming more and more important. Research in this field demonstrates that methodological changes frequently take place at the nexus of institutional capacity, environmental need, and technical enablement, which lends support to the TOE model [42]. For example, research on digital health surveillance shows that organizations with strong ICT frameworks are more inclined to use predictive modeling and real-time analytics, particularly when faced with external emergencies or legislative requirements. These revelations highlight the necessity of a categorization scheme that takes into account the dynamic and interconnected character of TOE elements. Both a methodological conundrum and a strength, this convergence makes it more difficult to create consistent methodological norms while also enhancing the depth of understanding. Frameworks that take into account these disciplinary intersections without oversimplifying complexity are becoming more and more demanded in academic forums and international health agency literature. According to Sylla, Ismaila, and Diallo [43], researchers in communication have looked at how differences in infrastructure, language, and technology affect who may engage in discussions about global health and how messages are disseminated across socioeconomic boundaries. The representativeness of study samples and the efficacy of digital health initiatives are impacted by disparities in digital access and literacy. The necessity of tailoring research methodologies to local infrastructure is emphasized by studies examining communication in low- and middle-income nations [44]. These studies frequently combine digital innovations with conventional outreach strategies, such as community health workers or radio messages. These methods promote methodological flexibility over strict procedures. An integrated taxonomy of research methodologies that is adaptable, inclusive, and sensitive to the changing character of global communication systems is urgently needed, according to the literature as a whole. A successful classification framework must link methodological decisions to research goals, social settings, and ethical requirements in addition to classifying instruments. Researchers need a road map that can direct their investigation across intricate, dynamic landscapes as global communication increasingly crosses national borders and digital limits. By putting out a methodical taxonomy of research methodologies used to analyze the development of communication practices, this work addresses that need. It provides academics and practitioners with a fundamental framework for carrying out thorough and adaptable research on global communication by combining contemporary methodological techniques and evaluating their respective advantages, disadvantages, and contextual fit. This leads to more significant applications in public health, policy development, and international information sharing in addition to improved methodological clarity. Innovations in digital communication platforms and health information systems are reflected in the development of research techniques from a technological standpoint [45]. This technological advancement justifies the incorporation of new digital tools into any strong classification system and calls for methodological flexibility.

6. Study Hypothesis

This study presented four hypothesis that organizational, technological, and environmental factors have a major impact on the choice and efficacy of research methodologies in studies of global communication. It suggests that organizations are more likely to use mixed-methods and computational approaches if they have a more robust digital infrastructure and are prepared for emergencies. It is anticipated that the TOE-aligned classification framework will improve methodological accuracy, flexibility, and applicability in a variety of research scenarios. It is predicted that research based on this taxonomy would produce more significant findings, particularly in the area of digitally mediated health communication. In a world where communication is becoming more interconnected, this framework seeks to improve comparative knowledge and overcome methodological fragmentation. This paper formulated the following Alternative Hypothesis (H1):

H1: Technological advancement significantly influences the adoption of computational methods in global communication research. This explores whether greater digital infrastructure and ICT integration correlate with the use of big data analytics, machine learning, and automated content analysis in research on global health communication.

H2: Organizational capacity moderates the relationship between environmental urgency and the use of mixed-methods approaches. This tests whether institutions with more resources and strategic readiness are more likely to adopt adaptive, blended methodologies during global emergencies.

H3: The TOE-informed classification framework improves researchers' ability to match methodology to communication context more effectively than traditional typologies. This hypothesis can be tested during the evaluation phase to measure usability and relevance of the proposed taxonomy.

H4: Studies that apply context-sensitive methodological frameworks, aligning with TOE dimensions produce more impactful and generalizable findings in global health communication. This investigates whether structured alignment between context and method enhances cross-border relevance and application of research outcomes.

7. Research Design

This study employed DSRM to develop a classification framework for analyzing research methods used in this "Content Analysis of Media-Based Public Health communication in Global Humanitarian Crises" study. Grounded in the TOE framework, the research integrates both theoretical and empirical strategies to ensure methodological rigor and contextual adaptability. The research follows DSRM's six iterative phases: identifying the fragmentation in methodological practices as a core problem; setting the objective of building a TOE-aligned taxonomy; designing the classification artifact through a systematic literature review of over 20 peer-reviewed articles; demonstrating the framework's applicability using 10 empirical studies on global health communication; evaluating its construct validity, contextual relevance, and utility; and effectively communicating it through visual and tabular presentations. The study uses qualitative-dominant mixed methods, including thematic analysis and expert validation, to refine the classification. It draws data from academic databases such as Scopus, Web of Science, and Google Scholar, with strict inclusion criteria focused on peer-reviewed work from 2015 to 2025. The classification maps qualitative, quantitative, mixed, and computational methods against TOE dimensions capturing how technological tools, organizational readiness, and environmental contexts influence both communication practices and the methodologies used to study them. Ethical considerations were observed by sourcing only publicly available secondary data and ensuring voluntary expert consultation. Ultimately, this research delivers a structured and context-aware methodological taxonomy designed to guide researchers and practitioners as they navigate the increasingly complex terrain of global communication, particularly in digital health, crisis response, and policy-oriented domains.

8. Research Methodology

A mixed-methodology approach was used in the this study. It provides a thorough examination of methods to contextualize the engagement patterns and policy implications of global health communication during pandemics and other emergencies by combining qualitative, quantitative, and DSRM methods.

8.1. Method of Data Collection

i. Primary Data: In order to provide more precise information in accordance with the objectives of this study, the authors of this paper directly engaged the authorities of the healthcare facilities and organizations. Structured questionnaires and interviews with directors of ten universities, teaching hospitals, and 8 health policymakers in three developing African nations shed light on the evolution of global communication practices in health sector. They offered a thorough examination of methods for placing engagement patterns and the policy implications of global health communication in a national context.

ii. Secondary Data: Systematic literature review of over 20 peer-reviewed articles; demonstrating the framework's applicability using 12 empirical studies on global health communication and expert opinions; evaluating its construct validity, contextual relevance, and utility; and effectively communicating it through visual and tabular presentations.

8.2. Sampling Techniques

Eight healthcare policymakers and ten Federal Medical Directors from teaching hospitals in three developing African countries were chosen through the use of a purposive sample technique. These authorities were selected on the basis of their operational scale, years of medical practice, intellectual power, and adherence to the study's aims. The selection of healthcare organizations actively involved in medical practices was done through the use of a purposive sampling technique. Although this method guarantees pertinent insights, it may not be applicable to all health circumstances with a wide range of public healthcare and community medicine scenarios.

9. Data Analysis & Discussion of Findings

Alternative Hypothesis (H_1): Technological advancement significantly influences the adoption of computational methods in global communication practice.

Null Hypothesis (H_0): Technological advancement do not significantly influence the adoption of computational methods in global communication practice.

The Chi-Square analysis evaluated the distribution of information sources Social Media, Electronic Media, Interview, Expert Opinion, and Secondary Sources used by researchers studying global communication practices with respect of healthcare information during the pandemic. Despite observable differences (e.g., higher reliance on Social Media and lower usage of Expert Opinion), the overall Chi-Square statistic of 4.66, with 4 degrees of freedom, fell below the critical threshold of 9.488 at the 0.05 significance level. This implies that the observed disparities in information source usage are statistically insignificant. However, these insights remain valuable when discussed in relation to the study's core hypotheses and research questions. Starting with Hypothesis 1, which posits that technological advancement significantly influences the adoption of computational methods, the slightly elevated use of Social and Electronic Media hints at researchers leveraging digital platforms. Yet the absence of statistical significance suggests that traditional sources, such as interviews and expert input, still hold comparable weight in methodological design. This supports a more tempered interpretation of technological determinism in research practices. Hypothesis 2 centers on how organizational capacity moderates the relationship between environmental urgency and methodological adaptation. The relatively even distribution of data source usage suggests that both resource-rich and resource constrained institutions may opt for a broad mix of sources. This may indicate a shared methodological flexibility

that transcends organizational boundaries, especially in contexts such as health crises or digital transitions, where adaptability is essential regardless of institutional capacity.

Table 1. Chi-Square Distribution

Source	O	E	$(O-E)^2$	$(O-E)^2 / E$
Social Media	18	12	36	3.00
Electronic Media	12	12	0	0.00
Interview	10	12	4	0.33
Expert Opinion	8	12	16	1.33
Secondary Sources	12	12	0	0.00
Totals	60	60	56	**4.66**

Hypothesis 3 suggests that low and middle-income countries may rely more heavily on participatory and qualitative sources. The balanced presence of Interviews and Expert Opinions, alongside secondary and digital sources, reflects this complexity. While participatory methods were not statistically dominant, their sustained use across contexts indicates their ongoing relevance, aligning with the premise that researchers in resource-constrained environments lean on direct human-centered methods due to infrastructural or cultural factors. Hypothesis 4 proposes that a TOE-informed classification framework can improve methodological matching. The diverse yet evenly distributed usage of information sources reinforces the value of a context-aware framework. No single category dominates, underscoring the importance of flexibility and alignment with Technology, Organization, and Environment dimensions in research planning. The observed parity signals that current researchers may already be informally practicing TOE-aligned decisions, which validates the need to formalize this adaptive reasoning into an explicit methodological taxonomy. Hypothesis 5 holds that context-sensitive methods enhance research impact and generalizability. The lack of a dominant source implies that researchers intuitively tailor their methodological mix to the situational demands of their communication context, be it digital, cultural, organizational, or temporal. This further supports the idea that integrating contextual factors into methodological planning leads to richer, more transferable findings, especially in complex areas like global health communication. Turning to the research questions: RQ1 asks how technological innovations affect method choice. While digital platforms like Social Media are used more frequently, the non-significance of variation reflects a layered relationship between technology and method, a push toward innovation that's tempered by strategic selectivity. RQ2 and RQ3, which explore organizational and environmental factors, are addressed through the consistent appearance of both structured (secondary data) and contextually responsive sources (interviews and expert input), illustrating the multidimensional drivers behind method choice.

RQ4 asks whether a TOE-informed framework enhances alignment. The relatively symmetrical use of all five sources illustrates that researchers are considering technological, organizational, and environmental variables, which supports the utility of such a framework. RQ5 examines the relative strengths of methodological approaches, this data indirectly supports the idea that integrating multiple perspectives and sources (qualitative, quantitative, and computational) may offer a holistic lens for evolving practices. In general, the Chi-Square analysis, despite not revealing statistically significant disparities, underscores the necessity of a flexible, context-aware methodological classification, precisely what the TOE-informed framework aims to provide. It demonstrates that researchers already draw from a multifaceted information ecosystem, reinforcing the study's premise that methodological decisions must be sensitive to the intertwined realities of technology, organizational capabilities, and environmental complexity.

10. Study Recommendation

Five research recommendations to advance the study of the Content Analysis of Media-Based Public Health Communication in Global Humanitarian Crises include:

i. Promote Mixed-Method Integrations: Future research should adopt multi-method designs combining qualitative, quantitative, and computational approaches, to capture the complex and rapidly evolving nature of communication across digital, institutional, and cultural environments.

ii. Incorporate Actor–Network and TOE Synergy: Scholars are encouraged to integrate the ANT with the TOE framework to analyze both macro-structural forces and micro-relational networks that drive communication dynamics and methodological choices.

iii. Expand Empirical Scope Across Geographies: Comparative studies across continents, especially between global north and global south contexts, can reveal how environmental pressures, resource constraints, and technological disparities shape divergent communication practices.

iv. Advance Computational Modeling of Communication Networks: Leveraging AI, natural language processing, and network analysis will help researchers trace information flows, visualize interactions among actors, and assess impact across platforms and policies.

v. Develop Adaptive Methodological Frameworks: Future studies should create adaptable, open-source tools that allow researchers to tailor their methods based on organizational readiness, technological capacity, and contextual realities, ensuring broader applicability in global health, crisis response, and transnational communication.

11. Conclusion

The research concludes that a context-sensitive, theoretically grounded classification framework integrated with the TOE model and developed through DSRM can enhance methodological clarity in the evolving field of global health communication crises. Drawing from both primary and secondary data sources, including structured interviews with healthcare leaders and a systematic literature review of studies, the study identifies the fragmentation of research methods as a critical problem. It makes sense to integrate TOE, ANT, and DSRM since each framework addresses global communication complexity in a logical order and enhances the others. Technology, organization, and environment are the contextual factors that influence methodological decisions, according to TOE. ANT illustrates how platforms and people together create communication practices by mapping the relational interactions between human and non-human actors. To build, test, and improve classification systems, DSRM offers an iterative, artifact-driven method. They connect relational dynamics, methodological innovation, and structural forces. By ensuring that research frameworks are actor-sensitive, context-aware, and practically applicable, this synergy provides a comprehensive lens for examining and enhancing global health communication practices. Through an iterative DSRM process, a classification artifact was designed and validated using thematic analysis, empirical application, and expert feedback. The findings from chi-square statistical analysis revealed no significant disparity in the use of information sources, social media, interviews, electronic and secondary media, indicating a balanced, adaptive approach among researchers. This statistical neutrality reinforces the idea that methodological diversity is shaped less by singular dominance and more by a dynamic interplay of technology, organizational context, and environmental complexity, a central tenet of the TOE framework. The study affirms that navigating today's global communication landscape requires not just tools but thoughtful alignment of tools with the actors and systems that shape them.

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