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Implementation of crisis PR using predictive analytics and AI models

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Abstract: The article systematises the methodological foundations for applying predictive analytics and artificial-intelligence (AI) models to proactive reputation-risk management. Its purpose is to analyse the distinctive features of crisis public-relations practice that integrates predictive analytics and AI-based models. The methodological basis rests on a systematic review of key scholarly publications from recent years devoted to machine learning, natural language processing (NLP), and their adoption in public-relations practice. A multilayer architecture for proactive integrated crisis management (PICM-AI) is proposed, encompassing data collection and monitoring, predictive analysis, scenario simulation, and automated preparation of communication materials. Particular attention is paid to the model's practical advantages—reduced response time to emerging threats and increased objectivity in decision-making—as well as to major challenges, including ethical dilemmas, data-bias risk, and the demand for highly qualified personnel. The findings are expected to interest communication scholars, PR practitioners, and executives seeking to enhance organisational resilience to reputational crises.

Keywords: crisis communication, public relations, artificial intelligence, predictive analytics, machine learning, natural language processing, reputation management, proactive management, NLP, crisis PR.

Introduction

The rapid pace of digitalisation and the widespread adoption of social media have raised both the volume and velocity of information circulation to unprecedented levels. A reputational disaster capable of inflicting multibillion-dollar losses on a corporation can originate from a single negative post and escalate into a large-scale crisis within hours. According to 2024 figures,

the global average cost of a data breach is USD 4.9 million, while organisations that actively employ artificial intelligence and automation for security save, on average, USD 2.2 million compared with those that do not [1]. Traditional crisis-communication approaches centred on post-event response are increasingly inadequate in the modern media ecosystem; their chief limitation is the considerable latency between the appearance of adverse information and the initiation of countermeasures, which markedly diminishes the effectiveness of subsequent actions. This circumstance necessitates a shift from reactive to proactive crisis management, requiring advanced technological solutions able to process large data streams in real time and forecast the evolution of negative scenarios. Artificial-intelligence systems and predictive analytics constitute the core tools for achieving this objective.

The current scholarly gap is manifested in the insufficient structuring and theoretical reflection of methodologies for integrating AI models into the day-to-day operations of public relations departments, as well as in the absence of a comprehensive framework that captures the entire cycle of proactive crisis management.

The purpose of the article is to analyse the specific features of implementing crisis public relations through the use of predictive analytics and AI models. The study's scholarly novelty lies in the presentation of an integrated, multi-stage model that combines predictive threat identification with automated crisis-scenario simulation and the generation of adaptive crisis-response strategies.
The research hypothesis posits that application of the proposed AI-oriented model will shorten the time required to detect and respond to reputational challenges compared with traditional methods, thereby achieving a greater reduction in potential financial and reputational losses.

Materials and Methods

In the literature on the implementation of crisis public relations with the use of predictive analytics and AI models, four thematic clusters of research can be identified. First, studies devoted to the development and deployment of predictive analytics models for strategic communications and crisis management. In particular, Lamba S. et al. [2] proposed a BERT-based approach to disaster data analysis that not only automatically classifies emergency messages but also forecasts resource requirements for effective response. Similarly, Nkembuh N. [10] demonstrated the application of machine learning methods to predict stakeholder sentiments and optimize communication strategies under crisis conditions, while Aladawi A. S. A. R., Ahmad A. N. A. [11] developed a model of factors influencing the adoption of artificial intelligence in a crisis-management system using NCEMA as a case study, highlighting the importance of organizational and technological determinants.

The second cluster encompasses research focused on social media analysis and the dynamics of information dissemination during crisis events. Ma X. et al. [3] examined methods for detecting and thematically analyzing emergency topics on social networks with consideration of the evolving roles of discussion participants, proposing a hybrid clustering and semantic-analysis algorithm. Yan Z. et al. [4] advanced this idea by combining data-mining techniques with time-series regression analysis to identify the key factors influencing the speed and breadth of "information contagion" on social media. At the same time, Hassani A., Mosconi E. [9] demonstrated that social analytics can serve as a source of competitive intelligence and help industrial SMEs develop dynamic capabilities, opening new horizons for the application of these tools in PR strategies.

The third cluster addresses transparency, explainability and ethics of AI systems in public relations. Thalpage N. [8] emphasizes the need for XAI techniques to build user trust in automated solutions and to open the "black box" of algorithms. Nies H., Zhao L. [7] analyze the potential of AI tools in the media market, highlighting the ethical risks associated with the automated creation and distribution of content. Meanwhile, Gartner experts offer practical recommendations for the integration of generative AI systems into the corporate environment, focusing on risk management and organizational readiness [6]. An innovative perspective on democratizing risk management is offered by Martelo R., Ahmadiyehyazdi K., Wang R. Q. [5] , who use GPT-4 to create an interactive AI assistant capable not only of forecasting flood threat levels but also of engaging the public through comprehensible visualizations of the model's results.

The fourth direction comprises empirical studies of the economic consequences of information-security incidents. For example, the IBM "Cost of a Data Breach Report 2024" provides comprehensive data on the average costs of mitigating data-breach consequences and confidentiality violations, serving as a basis for assessing financial risks when developing crisis-communication plans [1].

Thus, despite the wide application of various approaches—from deep neural networks and regression models to XAI methodologies and generative AI assistants—the literature reveals several contradictions. On one hand, technical studies [2, 4] concentrate primarily on accuracy metrics and processing speed, often overlooking issues of organizational implementation and user perception covered in studies [7, 11]. On the other hand, research on ethics and XAI [5, 8] lacks concrete guidance on integrating these systems into existing PR processes and evaluating their practical effectiveness. Moreover, the topics of multimodal analysis (texts, images, video), cross-cultural adaptation of AI solutions and assessment of their long-term impact on organizational reputation remain underexplored.

Results and Discussion

Considering the gaps and limitations revealed by the literature review and seeking to shift the emphasis from reactive practices to proactive reputation-risk management, the Proactive-Integrative Crisis Management model based on artificial intelligence (PICM-AI) is proposed. This conceptual framework (see Figure 1) integrates predictive-analytics and AI techniques within a closed, self-regulating cycle comprising four interrelated stages, each of which enables continuous algorithm refinement and prompt responses to potential threats to an organization's reputation.

РисунокСформированноеизображение

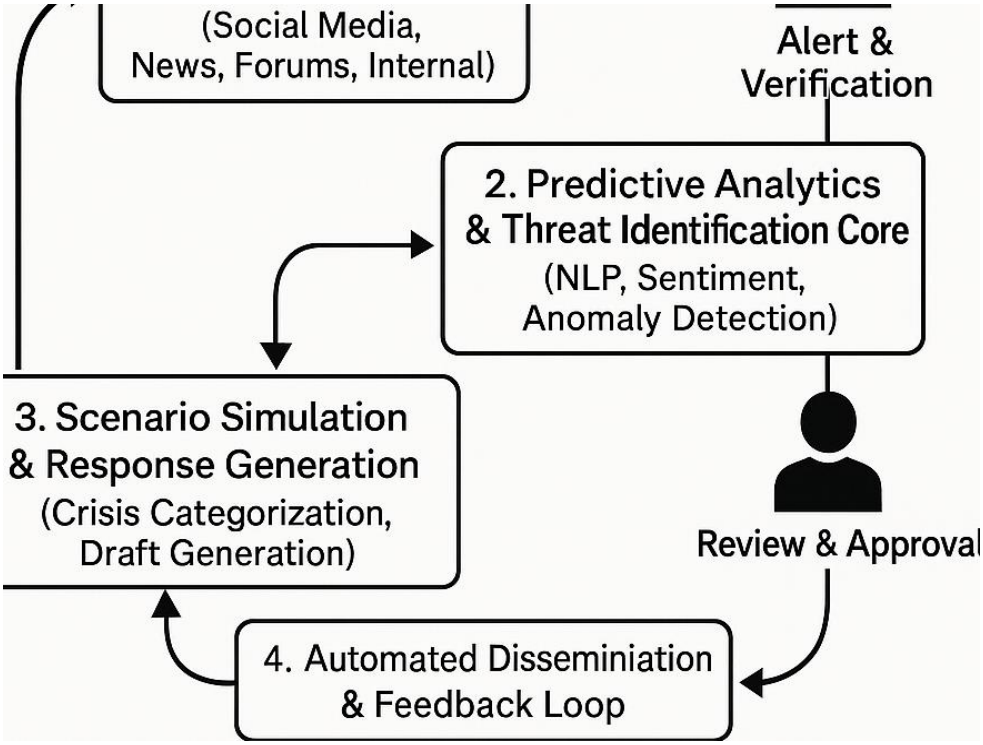

Fig. 1. Proactive-integrative crisis management model (PICM-AI) (compiled by the author based on the analysis of [3, 4, 5]).

As illustrated in Figure 1, the initial stage— "Data Ingestion & Real-Time Monitoring"—provides the foundation of the entire system. During this phase, information is continuously collected from numerous heterogeneous channels: social-media APIs (X/Twitter, Facebook, Telegram), news aggregators, professional forums, blogs, review platforms, and the organisation's internal resources (support-ticket logs and CRM data). Unlike conventional monitoring solutions, the proposed approach can process not only textual data but also multimodal content—memes, videos, and other formats—thereby identifying negative connotations associated with the brand [9].

Stage Two—the Predictive Analytics & Threat Identification Core—serves as the analytical hub of the model. The incoming data stream is processed by three types of algorithms operating in parallel. First, transformer-based NLP models (e.g., BERT) conduct an in-depth analysis not only of sentiment (positive, negative, neutral) but also of emotional nuances (anger, fear, distrust) and detect sarcasm, which is essential for an accurate assessment of public sentiment [2, 3]. Second, anomaly-detection mechanisms (Isolation Forest, LSTM autoencoders) compare current metrics—mention frequency, propagation speed, and sentiment—with historical baselines; abrupt deviations (for example, a sudden surge in negative mentions at an atypical time) are interpreted as potential threats [4]. Third, the system automatically assigns each identified crisis to a category (operational, financial, ethical, or legal) and generates an alert for the PR team that includes a concise summary of the issue's origin, scale, threat type, and short-term dynamics forecast.

The third stage— "Scenario Simulation and Response Generation"—demonstrates the approach's scientific and practical novelty. Once a human confirms the threat, two complementary processes are launched. On one side, artificial intelligence uses the threat's category and historical cases to construct several probabilistic crisis-development models (optimistic, realistic, and pessimistic). On the other, for each scenario, a generative language model comparable to GPT-4, trained on examples of successful communications and the company's internal standards, drafts crisis-management materials [5, 10]: an initial holding statement for the media, a Q&A document containing potential questions and answers, and an internal message for employees with instructions and key points. These drafts are then forwarded to a public-relations specialist for refinement and approval, which reduces the response-preparation time from the traditional several hours to just a few minutes [1; 4–6].

The closed-loop process culminates in the fourth stage—Automated Dissemination and Feedback Loop. Once a specialist has completed verification, crisis-response materials are transmitted without delay through designated channels. The stage's primary function, however, is to organize feedback: the system captures audience reactions to published messages in real time, analyzing shifts in discussion tone, the emergence of new questions, and the ways in which official statements are cited. These data are immediately routed to the second stage—the predictive-analytics core—allowing forecasts to be revised promptly and the communication strategy to be adjusted. Consequently, the PICM-AI model functions not as a static tool but as a dynamic, self-learning system capable of adapting to the progression of a crisis situation.

The implementation of this model entails not only technological but also organizational challenges. Operational effectiveness is directly determined by the quality and representativeness of the training data. Bias in the original sample—for example, the exclusion of opinions expressed on niche platforms—can create blind spots in monitoring [7, 8, 11]. In addition, public-relations professionals must broaden their competencies: beyond traditional communication skills, they require a solid understanding of AI principles, the ability to interpret its outputs, and the capacity to critically validate generated materials.

Table 1 reflects the advantages, disadvantages and future trends of implementing crisis PR using predictive analytics and AI models.

Table 1. Advantages, disadvantages and future trends of crisis PR implementation using predictive analytics and AI models (compiled by the author based on analysis of [3, 7, 8, 10]).

Aspect of Analysis	**Advantages**	**Disadvantages**	**Future Trends**
Reaction speed	Rapid detection and prevention of crises through automated monitoring	Misinterpretation of situations due to insufficient model accuracy	Improvement of model accuracy via deep learning and adaptive algorithms

Forecast quality	Enhanced crisis prediction by analysing large datasets and uncovering hidden patterns	Dependence of accuracy on input data quality and availability of historical examples	Adoption of generative AI models to simulate crisis scenarios
Personalization	Ability to tailor crisis communication and responses based on analysis of audience preferences and behaviour	Risk of privacy breaches and ethical violations when using personalised data	Enhancement of data protection mechanisms and development of ethical standards for AI use in PR
Resource optimization	Reduction of time and resource expenditure through automation of routine analytical tasks and monitoring	High initial costs for technology implementation and staff training	Decrease in solution costs through cloud technologies and simplification of user interfaces
Strategy adaptability	Ability to rapidly adjust PR strategies to changing conditions via real-time data analysis and forecasts	Difficulty integrating new models with established workflows of PR teams	Development of open-architecture AI platforms facilitating integration with existing PR systems
Reputation management	More effective and timely management of reputational risks through early detection and proactive measures	Loss of control in case of incorrect AI decisions, potentially exacerbating the crisis	Emergence of hybrid approaches combining human expertise with AI model recommendations

Further discussion indicates that the PICM-AI system can radically reshape crisis communication, shifting the emphasis from the classical “response-and-recovery” paradigm to a “prediction-and-prevention” model. The platform not only accelerates responses to crises that have already emerged but also enables the detection and neutralization of potential risks at the “weak-signal” stage within the information flow. In this context, artificial intelligence serves as an auxiliary instrument that augments professional capabilities: critical thinking, ethical judgment, and empathy remain human prerogatives, whereas AI automates routine processes, handles vast data volumes, and provides an analytical basis for timely and well-balanced decisions.

Conclusion

The study has broadened and deepened current understanding of the role of predictive analytics and artificial intelligence in managing communication crises. Unlike existing fragmented methodologies, the proposed PICM-AI framework unifies—in a single self-learning cycle—the stages of data acquisition and processing, predictive threat identification, crisis-scenario modeling, automated development of crisis communications, and subsequent analysis of feedback effectiveness.

The findings confirm the hypothesis that the adoption of AI shortens the interval from the emergence of a threat to the first public response, a reduction that is vital for minimizing reputational damage and preserving organizational market capitalization. The PICM-AI model fundamentally redefines the crisis-management paradigm, shifting the focus from retrospective reaction to predictive forecasting and preventive risk neutralization. At the same time, the study revealed that successful integration of such systems is feasible only if the quality and objectivity of training datasets are assured, specialized competencies among public-relations practitioners are developed, and strict ethical standards are upheld to avert the dehumanization of

communication. Within this framework, artificial intelligence is regarded not as a substitute for specialists but as a multi-layered tool that markedly augments human analytical and creative capabilities. Future research should aim to refine simulation-modeling algorithms and multimodal analysis and to establish industry standards for the responsible use of AI in public-relations practice.

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