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ARTIFICIAL INTELLIGENCE AS A MEMBER OF CRISIS MANAGEMENT LEADERSHIP – BENEFITS, LIMITATIONS, AND THE PSYCHOLOGICAL IMPLICATIONS OF HYBRID DECISION-MAKING

David Mazák,
PhDr.Ed. D., MBA, Doktorand DTI Dubnica nad Váhom
orcid.org/0009-0008-5789-5622
mazak@email.cz

Michał Wacławik,
Prof. u Dr. Ed. D., rektor Wyższa Szkoła Nauk Społecznych i Bezpieczeństwa
orcid.org/0009-0004-8403-786X
waclawikmichal@gmail.com

Summary. This article examines the integration of artificial intelligence as a constituent element within crisis management leadership structures, focusing on the technological, psychological, and ethical implications of hybrid decision-making systems. The study addresses a significant gap in scholarly attention regarding the psychological and ethical consequences of AI integration in emergency management, while acknowledging that technological dimensions have been relatively well-investigated. The primary objective is to present both the potential benefits and principal risks associated with incorporating AI into crisis response teams.

The research highlights several functional advantages of AI integration, including enhanced predictive capabilities through real-time data synthesis, improved logistics optimization, and significant reduction of cognitive burden on human decision-makers. AI-supported predictive models can reduce median response times by up to 30% in countries employing machine learning-based systems, while optimization algorithms demonstrate 10–18% improvements in emergency unit response times compared to static distribution models.

However, the study identifies substantial risks including automation bias, where human operators accept algorithmic recommendations uncritically, and the "black box" problem where AI decision-making processes lack transparency.

Additional concerns include dependence on data quality, the erosion of individual and collective autonomy, information overload, and the emergence of accountability gaps in decision-making processes. The integration significantly impacts team dynamics, with potential effects on trust, autonomy, psychological safety, and communication patterns within crisis management teams. The research emphasizes the "responsibility gap" phenomenon, where attribution of accountability becomes ambiguous when decisions are influenced by algorithmic systems.

The article concludes with foundational recommendations for safe and effective AI deployment, emphasizing the "human-in-the-loop" approach, ensuring system explainability, comprehensive training programs, and adherence to European legislative frameworks, particularly the Artificial Intelligence Act. The authors stress that successful integration requires combining technical precision with human responsibility, viewing AI as a complement rather than replacement for human judgment in crisis management contexts.

Keywords: artificial intelligence, crisis management, decision-making, cognitive load, ethics, responsibility, algorithmic trust, emergency response, security management, European legislation.

1. Introduction

The rapid advancement of artificial intelligence is transforming traditional structures of crisis management, giving rise to hybrid environments in which artificial intelligence operates as an autonomous member of the crisis response team. This shift reflects a broader trend toward the principle of "Human-Centered Artificial Intelligence", which seeks a balanced integration of automation and human oversight in order to enhance the efficiency and safety of decision-making processes (Shneiderman, 2020).

Trust in technological tools constitutes a critical condition for their successful integration into high-stakes operational structures. Research indicates that, within the domain of crisis management, it is essential for users to understand not only the functionality but also the limitations of artificial intelligence. The absence of such transparency may result in automation bias, characterised by overreliance on algorithmic outputs, or, conversely, in algorithm aversion, whereby users reject or disregard the input provided by artificial agents (Glikson and Woolley, 2020).

From the perspective of crisis team psychology, psychological safety plays a central role. This construct refers to a shared belief that the team environment is safe for interpersonal risk-taking, including expressing opinions, experimenting, or reporting errors without fear of reprisal (Edmondson, 1999; Lee et al., 2004). The integration of artificial intelligence into the decision-making team may contribute positively to psychological safety by relieving team members of routine operational burdens. At the same time, however, it may weaken this construct by obscuring lines of responsibility or diminishing the presence of human control.

The aim of this article is to describe the technological and operational benefits of artificial intelligence in crisis scenarios, such as predictive modelling, simulation, and real-time data analysis. Furthermore, the article seeks to identify the main limitations and risks associated with integration processes, including the quality of training data, lack of contextual understanding, and ambiguities in accountability for autonomous decisions. An additional focus is the psychological impact of these changes on team dynamics and cognitive workload, as well as the consequences of human distrust in artificial intelligence-driven decision-making. The article concludes with a set of proposed principles for the integration of artificial intelligence into crisis management, including training frameworks and the development of effective human-technology collaboration.

2. The Benefits of Integrating Artificial Intelligence into Crisis Management

The inclusion of artificial intelligence in the decision-making processes of crisis management confers a number of functional advantages with the potential to substantially increase efficiency both at the level of strategic planning and at the level of operational interventions in the field. These advantages are not confined to the technological domain; they also extend to organisational effectiveness, to the psychological strain and cognitive load borne by crisis personnel, and to the overall resilience of the system when confronted with unexpected events.

At present, artificial intelligence plays an important role in the acquisition and processing of data in real time, in forecasting the development of emergency situations, in the optimisation of resources and associated logistics, and in the modelling of alternative courses of action through “what-if” simulations. Owing to its capacity to process very large volumes of data more rapidly than human operators, artificial intelligence can function as a significant supporting element within decision-making structures, one that augments and complements human judgment in environments characterised by high complexity and uncertainty.

Prediktivní modelování a včasné varování

AI podporované prediktivní modely dokážou syntetizovat meteorologická, geologická i sociální data v reálném čase a vytvářet scénáře, které zlepšují poměr „varování vs. reálný zásah“. Globální přehled systémů včasného varování dokládá, že státy s nasazenými ML-modely snižují střední dobu reakce až o 30 % (UNDRR, 2023).

Komplexní prediktivní framework však předpokládá robustní datovou infrastrukturu a standardizovaná rozhraní, která jsou v některých zemích stále nedostatečná (Comfort, 2019).

Predictive Modelling and Early Warning Systems

Artificial intelligence-driven predictive models are capable of synthesising meteorological, geological, and social data in real time in order to generate scenarios that improve the ratio between issued warnings and actual emergency responses. A global review of early warning systems has demonstrated that countries employing machine learning-based models are able to reduce median response times by up to thirty percent (United Nations Office for Disaster Risk Reduction, 2023).

However, the implementation of a comprehensive predictive framework presupposes the existence of a robust data infrastructure and standardised system interfaces, which remain insufficient or underdeveloped in certain national contexts (Comfort, 2019).

Optimisation of Resource Allocation and Logistics

Artificial intelligence based optimisation algorithms, such as linear programming methods reinitialised in accordance with real time sensor input, have been shown to reduce the response time of emergency units by approximately ten to eighteen percent when compared with static distribution models (Kapucu, Hawkins, and Rivera, 2013).

For instance, Wei (2024), in a simulation involving five thousand logistical convoys, demonstrates that reinforcement learning based platoon coordination, specifically the TA QMIX architecture, can reduce fuel consumption by an average of nineteen percent while maintaining only minimal delay, amounting to an average of 9.6 minutes per vehicle.

What If Simulations and Decision Support

Integrated simulation engines make it possible to execute hundreds of parallel scenarios within a matter of seconds, combining variables such as varying rates of wildfire spread, road accessibility, and forecasts of infrastructure utilisation and availability. The outcome is a quantifiable representation of uncertainty and a formal evidentiary basis for decision making grounded in factual data (United Nations Office for Disaster Risk Reduction, 2023).

The Israeli crisis management environment serves as a notable example in which the use of artificial intelligence for data processing and decision support has substantially reduced the length of the overall decision making cycle. In certain experimental settings, specific procedures have been shortened to a matter of minutes rather than the tens of minutes that were previously required (Jerusalem Post Staff, 2023).

3. Limitations and Risks of Integrating Artificial Intelligence in Crisis Management

Despite the increasing potential of artificial intelligence in the field of crisis management, it is essential to highlight its limitations, which may negatively influence not only the quality of decision making but also the psychological dynamics of crisis teams. These risks concern both technical constraints, such as the quality of input data and the error rates of algorithmic systems, and human factors, particularly those related to trust, acceptance, ethical reflection, and the shifting of responsibility.

Dependence on Data Quality and Availability

Artificial intelligence is highly dependent on the quality, availability, and reliability of input data. In emergency situations, data are often disrupted, incomplete, or distorted, which places considerable demands on the explainability and robustness of the system (Barredo Arrieta et al., 2020). If the model has not been trained on crisis scenarios with a similar structural profile, it may generalise incorrectly, potentially resulting in flawed assessments of the situation.

Insufficient or distorted data, such as manipulated visual inputs or compromised sensor readings, can lead to what is commonly referred to as the garbage in garbage out effect. Artificial intelligence processes such data with a high degree of internal confidence, yet the resulting outputs may be entirely unusable. This phenomenon has been repeatedly demonstrated in cases where a minimal alteration of just a few pixels was sufficient to cause a stop sign to be misclassified as a different traffic symbol (Heaven, 2019).

Automation Bias and the Loss of Human Vigilance

The phenomenon known as automation bias refers to the human tendency to accept algorithmic recommendations uncritically, even in cases where such recommendations are demonstrably flawed. Research conducted in fields such as aviation and medicine has shown that excessive trust in artificial intelligence can lead to a decline in cognitive alertness and the displacement of human judgment (Glikson and Woolley, 2020).

In the context of crisis management, where decision making often relies on incomplete information, improvisation, and moral reasoning, this tendency poses a significant risk. Decisions that ought to be collectively validated by the team are instead accepted mechanically, without adequate critical reflection or deliberation.

Opacity of Decision-Making Processes (The Black Box Problem)

Many advanced artificial intelligence models, particularly those based on deep learning architectures, operate as so-called black boxes, meaning their internal decision-making logic cannot be transparently explained. In crisis scenarios, where a high degree of accountability is required, this constitutes a fundamental problem (Burrell, 2016).

For instance, if an artificial intelligence system recommends that a certain area should not be evacuated and fatalities subsequently occur, it is nearly impossible to determine on what basis, or according to which weighted factors, the system reached that recommendation. This significantly complicates post hoc analysis, legal and institutional accountability, and undermines the acceptance of the technology by both professionals and the broader public.

Ethical Dilemmas and Ambiguous Responsibility

One of the most serious aspects of deploying artificial intelligence in decision-making processes is the ambiguity of responsibility. When an outcome is generated by an algorithm, who should be held accountable for its consequences? Is it the operator who accepted and acted upon the result of the analysis, the system developer who designed the model, or the organisation that authorised its use?

In academic literature, this phenomenon is referred to as the responsibility gap (Matthias, 2004), a situation in which no individual or entity is clearly able to assume responsibility for a flawed or harmful decision, precisely because that decision was not made by a fully human agent. Within crisis management teams, such ambiguity may result in hesitation or avoidance of decision-making altogether, or conversely, in a form of institutionalised evasion of accountability.

Psychological Strain and Technological Distrust

Individuals who find themselves operating within mixed teams that include artificial intelligence may experience a diminished sense of autonomy, control, and self-confidence, particularly when they are not sufficiently familiar with the functioning of the technology. This can have adverse effects on team dynamics, open communication, and psychological safety.

Moreover, under conditions of extreme stress, individuals may experience what is known as technostress a combination of frustration, anxiety, and cognitive overload resulting from interactions with demanding technological systems (Tarafdar et al., 2007).

4. Psychological Impacts of Artificial Intelligence Integration on Crisis Teams

The introduction of artificial intelligence into the decision-making structures of crisis management affects not only the functionality of systems and the effectiveness of operations, but also reaches deeply into the psychological dynamics of team collaboration. In environments characterised by high levels of stress, intense time pressure, and responsibility for human lives, factors such as trust, autonomy, safety, and communication become critical to the successful integration of technological systems.

Recent European research (Scantamburlo et al., 2023) indicates that the level of trust in artificial intelligence varies significantly across the member states of the European Union, and that distrust is most frequently associated with concerns about the loss of control and the ambiguity of responsibility.

Trust as a Prerequisite for Cooperation

Trust in technology is a fundamental prerequisite for the effective functioning of human-machine teams. Empirical studies confirm that when users perceive artificial intelligence as predictable and comprehensible, their acceptance of its outputs and their willingness to engage with the system increase accordingly (Siau and Wang, 2018; Glikson and Woolley, 2018). In contrast, fragile trust may be easily undermined by a single erroneous or non-transparent decision made by the artificial intelligence system (Lee and See, 2004).

From the perspective of the Czech context, this issue has been addressed, for example, by Martinková (2024), who, based on a case study, warns that in the absence of adequate user training and a critical approach, artificial intelligence in civil protection may be perceived as an "incomprehensible authority", thereby weakening user participation.

Autonomy and the Loss of Control

The introduction of autonomous decision-making systems may lead to a perceived loss of autonomy among members of crisis response teams. This phenomenon, commonly referred to as deskilling, has been repeatedly documented in relation to routine decisions being delegated to artificial intelligence. Within the European context, Schuett (2022), in his analysis of the Artificial Intelligence Act, highlights the risk of delegating responsibility to algorithms without the establishment of a clear supervisory mechanism.

In the Czech academic discourse, this issue is addressed, for example, in the recommendations of Tomas Bata University in Zlín (2024), which emphasise the importance of preserving the human capacity for critical judgment within the decision-making process, even in cases where artificial intelligence proposes specific courses of action.

Communication and Informational Asymmetry

One of the recurring challenges in mixed human-artificial intelligence teams is the asymmetry in access to and interpretation of information. While artificial intelligence operates on the basis of structured data,

human team members rely on contextual understanding, intuition, and experiential knowledge. When artificial intelligence systems are not designed with a sufficient degree of explainability, meaningful discussion becomes more difficult and open communication within the team may be compromised.

This concern is also reflected in the conclusions of a research report by the European Crisis Management Laboratory (ECML, 2023), which emphasises that in the operational practice of European Union crisis institutions, such as the Emergency Response Coordination Centre, it is essential to supplement artificial intelligence with so-called translation layers that is, individuals capable of interpreting and clearly explaining artificial intelligence outputs to other members of the team. Without such mediation, there is a heightened risk of communication bottlenecks and disruption of decision-making consensus.

Psychological Safety

Psychological safety is essential for effective collaboration within crisis management teams. It fosters open feedback, the identification of errors, and the sharing of alternative perspectives (Edmondson, 1999). However, when artificial intelligence systems are not open to criticism, or when their outputs cannot be meaningfully questioned, there is a risk of internal self-censorship and a reduction in the scope of team-based discussion.

Within the framework of the proposed Artificial Intelligence Act, Hacker (2023) emphasises the need for so-called high-risk systems to remain auditable, transparently documented, and subject to human intervention. These principles apply fully to artificial intelligence tools employed in crisis management contexts.

Cognitive Load and Technological Stress

It is also essential to account for the increased cognitive load that may result from the presence of artificial intelligence systems. Operators are required to simultaneously process data, interpret system outputs, and reassess their own decisions. This condition leads to psychological fatigue and elevates the risk of experiencing what is commonly referred to as technostress.

In a European study conducted by Scantamburlo et al. (2023), fifty-eight percent of respondents reported that artificial intelligence technologies used in crisis systems induce tension and a sense of being obstructed by an "interfering assistant," particularly in situations where the role of the system and the boundaries of its responsibility are insufficiently defined.

5. Ethical and Accountability Dilemmas

The integration of artificial intelligence into the decision-making structures of crisis management gives rise not only to technical and psychological challenges, but also to profound ethical and legal issues. A central concern is the attribution of responsibility for decisions that are either partially or entirely influenced by algorithmic systems, particularly in scenarios where such outputs may have a direct impact on the protection of public health and human life.

The Responsibility Gap and Algorithmic Decision Making

The concept of the responsibility gap (Matthias, 2004) refers to situations in which it is not possible to clearly determine the subject who bears responsibility for a decision made by an artificial intelligence system. In crisis situations, this may involve, for example, a decision not to evacuate a given area, the incorrect prioritisation of resources, or the underestimation of critical risks.

From a legal perspective, three levels of responsibility converge in such cases:

- technological responsibility, referring to the developer of the system
- institutional responsibility, referring to the organisation that implements the artificial intelligence system
- individual responsibility, referring to the person who applies the output of the system in practice

As Schuett (2022) observes, the European Artificial Intelligence Act introduces new obligations for so called high risk artificial intelligence systems, such as those used in crisis management or healthcare. These systems must be fully documented, subject to auditing procedures, and remain accessible to human supervision. Nonetheless, many decision making scenarios remain outside the scope of clearly defined legal frameworks and continue to pose serious challenges to the attribution of accountability.

The Obligation of Explainability and Transparency

One of the principal ethical requirements is that the outputs of artificial intelligence systems must be understandable and explainable not only to technical specialists, but also to ordinary users within crisis response teams. A lack of transparency, particularly in so called black box models, undermines the capacity for critical evaluation and complicates the reversibility of decisions.

Both European research and regulatory frameworks agree that systems employed in crisis management must allow for ex post review of algorithmic decisions and must be able to demonstrate the specific inputs and reasoning that led to a given outcome (Hacker, 2023). Failure to meet these requirements results in the erosion of fundamental rights, including the right to information, the right to due process, and the right to personal security.

Proportionality, Discrimination, and Algorithmic Bias

An additional ethical risk lies in algorithmic bias, which may manifest in areas such as the prioritisation of evacuation routes, the identification of so called high risk groups, or the analysis of population behaviour during emergency responses. If an artificial intelligence system relies on training data that are not representative, it may generate outcomes that are discriminatory, even in the absence of any deliberate intent on the part of the developers.

According to Articles 10 and 15 of the Artificial Intelligence Act, operators are required to demonstrate that their systems have undergone testing for bias and disproportionality. However, in the context of real time crisis response, such validation is not always technically feasible (Schuett, 2022; Pricewaterhouse-Coopers Czech Republic, 2024).

The Absence of National Standards and Methodologies

In the Czech national context, there are currently no specific ethical guidelines or national methodological frameworks governing the use of artificial intelligence in crisis management. Tomas Bata University in Zlín (2024), in its institutional recommendations, emphasises that operators should receive regular training not only in the technical use of artificial intelligence tools, but also in ethical dilemmas and in the limitations of algorithmic applications, particularly in cases where the system influences life-critical decisions, the prioritisation of patients, or the deployment of emergency response units.

From a legal perspective, the Czech Republic is considering the application of the general liability provisions as outlined in Act No. 89/2012 Coll., the Civil Code. However, in the specific domain of crisis decision making involving artificial intelligence, no dedicated case law currently exists.

Ethical Design and the Human in the Loop Approach

A promising response to both ethical and accountability uncertainty is the human in the loop approach, which maintains the human operator as the final decision-making authority. Within this framework, artificial intelligence functions strictly as an advisory tool, not as an autonomous agent. This approach is also favoured in the proposed Artificial Intelligence Act and is grounded in the principle of ethical by design architecture (Grosz et al., 2019).

In practice, this means that systems should be designed to:

- enable human intervention in real time
- inform users about the underlying logic of their outputs
- be subject to auditing and thorough documentation
- provide an emergency override function in critical situations

6. Recommendations for Practice

The integration of artificial intelligence into crisis management requires a carefully considered approach that accounts not only for technological capabilities, but also for the psychology of human teams, ethical principles, and existing regulatory frameworks. Based on the preceding analyses, it is possible to identify several practical recommendations that may support the effective and safe implementation of artificial intelligence in the context of emergency management operations.

Ensuring Explainability and Transparency of Systems

Artificial intelligence systems used in crisis management should be designed in accordance with the principles of explainable artificial intelligence. Users must be able to understand how and why the system recommends specific measures, as this enhances both trust and the ability to retrospectively assess

decisions (Glikson and Woolley, 2020; Hacker, 2023). Explainability is also a formal requirement under the Artificial Intelligence Act for high risk systems, as outlined in Articles 13 and 14.

Recommendations:

a) Prioritise algorithms that produce interpretable outputs.

b) Implement user-friendly interfaces for the presentation of decision-making criteria.

c) Require developers to provide documentation of artificial intelligence models, such as model cards.

Education and Training of Crisis Teams in the Use of Artificial Intelligence

The successful integration of artificial intelligence depends on the digital literacy and psychological preparedness of its users. Research findings (Scantamburlo et al., 2023; Tomas Bata University in Zlín, 2024) indicate that a lack of information contributes to technostress, resistance to technology, and the uncritical overreliance on artificial intelligence outputs.

Recommendations:

a) Incorporate modules on artificial intelligence into crisis management training programmes.

b) Use decision-making scenarios with and without artificial intelligence to strengthen critical thinking.

c) Encourage operators to develop ethical awareness of responsibility in the use of artificial intelligence, also referred to as accountability literacy.

Ethically Oriented Design (Ethics by Design)

Artificial intelligence tools should be developed in accordance with ethical principles that respect human dignity, individual autonomy, and non-discrimination. This approach requires interdisciplinary collaboration among developers, psychologists, legal experts, and crisis managers (Grosz et al., 2019).

Recommendations:

a) Apply established frameworks such as the OECD AI Principles or the European Commission's Guidelines for Trustworthy Artificial Intelligence.

b) Conduct regular ethical audits of artificial intelligence systems.

c) Enable user feedback to be incorporated into the design of system functions.

Organisational Integration

Artificial intelligence systems frequently produce complex outputs that may not be easily understood by non-expert users. Crisis management practice within institutions of the European Union, such as the Emergency Response Coordination Centre, has demonstrated the need for a new organisational role referred to as the interface officer. This individual is responsible for translating algorithmic outputs into the decision-making language of the operational team (European Crisis Management Laboratory, 2023).

Recommendations:

a) Create a specialised position that serves as a mediator between artificial intelligence systems and the decision-making centre.

b) Provide opportunities for real time consultation when evaluating algorithmic proposals.

c) Establish internal rules and procedures for validating artificial intelligence outputs within crisis response teams.

Legal Framework and Responsibility Protocols

Given the development of European legislation, particularly the Artificial Intelligence Act, it is essential that organisations operating in the fields of security and crisis management actively adapt their internal regulations accordingly.

Recommendations:

a) Categorise artificial intelligence tools in use according to their level of risk, distinguishing between low, medium, and high risk.

b) Define clear standards of responsibility specifying who is authorised to approve, question, or override outputs generated by artificial intelligence systems.

c) Maintain records of decisions influenced by artificial intelligence for the purpose of retrospective audit and accountability.

7. Conclusion

The integration of artificial intelligence into crisis management structures represents one of the most significant shifts in contemporary security governance. This article has demonstrated that artificial

intelligence can serve as an effective supporting member of crisis response teams, provided its implementation is technically sound, psychologically acceptable, and ethically grounded.

Key benefits have been identified, including accelerated data processing, the modelling of alternative scenarios, logistics optimisation, and the reduction of cognitive load. At the same time, the analysis has highlighted critical limitations and risks, such as issues of explainability, automation bias, the erosion of operator autonomy, psychological strain, and ambiguity in the attribution of responsibility for decisions influenced by algorithmic systems.

The European regulatory framework, represented above all by the proposed Artificial Intelligence Act, provides a foundation for the controlled deployment of artificial intelligence in crisis systems. It enables risk categorisation, defines the requirement for human oversight, and establishes minimum standards for transparency, auditability, and non-discrimination.

From a psychological perspective, it is essential that artificial intelligence not be perceived as a replacement for human judgment, but rather as a complement to the decision-making process one that strengthens the capacity of human teams to respond effectively to complex and dynamic situations. Trust, training, shared responsibility, and critical reflection constitute essential conditions for future cooperation between human actors and technological systems in the context of crisis management.

Future Outlook

The intersection of artificial intelligence and crisis management warrants continued interdisciplinary research. Future work should focus in particular on the following areas:

• empirical studies on the real-world deployment of artificial intelligence in national and European crisis response structures

• qualitative research on the attitudes of operators, dispatchers, and analysts working with artificial intelligence under high-stress conditions

• the development of training methodologies and ethical frameworks for the use of artificial intelligence in emergency contexts

• evaluation of the impact of regulatory measures, such as the Artificial Intelligence Act, on the operational practice of public institutions

The successful integration of artificial intelligence into crisis management will not be achieved primarily through technological advancement, but rather through the capacity to combine technical precision with human responsibility.

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