Unmanned Systems and Civil-Military Integration: Ethical and Operational Implications in Humanitarian Missions

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Abstrak

The rapid advancement of unmanned systems, including unmanned aerial vehicles, unmanned ground vehicles, and autonomous maritime platforms, has significantly transformed the operational landscape of humanitarian missions. These technologies enhance situational awareness, accelerate response times, and enable access to high-risk or inaccessible environments. However, their integration into humanitarian contexts introduces complex ethical, legal, and operational challenges, particularly in relation to civil-military cooperation. This study examines the role of unmanned systems in shaping contemporary humanitarian operations through a qualitative approach that combines a systematic literature review with a case study of Indonesia. The study proposes a novel conceptual framework, the Ethical-Operational Integration Model, which integrates ethical governance, operational coordination, and technological accountability. The findings indicate that while unmanned systems improve efficiency and coordination, their effective deployment depends on robust governance frameworks, ethical safeguards, and institutional alignment. This research contributes to the growing discourse on technology-enabled humanitarianism by offering an integrative perspective that bridges innovation, governance, and ethics.

Keywords: Unmanned Systems, Civil-Military Integration, Humanitarian Missions, UAV, Ethics, Disaster Governance.

INTRODUCTION

The humanitarian landscape in the twenty-first century is increasingly characterized by complexity, uncertainty, and interconnected global risks. Climate change, environmental degradation, rapid urbanization, and protracted crises have intensified the scale and frequency of disasters, placing unprecedented pressure on humanitarian systems (United Nations, 2015). In response to these challenges, technological innovation has emerged as a critical enabler of more efficient and adaptive humanitarian action (Meier, 2015). Among these innovations, unmanned systems have gained particular prominence due to their ability to transform how information is generated, processed, and utilized in disaster contexts. Unmanned aerial vehicles provide real-time surveillance, high-resolution mapping, and logistical support, significantly improving situational awareness and operational effectiveness (González et al., 2016). These capabilities are especially valuable in environments where infrastructure damage limits accessibility.

However, the integration of unmanned systems is not merely a technical development; it represents a broader transformation that reshapes institutional roles, governance structures, and power relations. A central dimension of this transformation is the increasing involvement of military actors in humanitarian operations. Military institutions possess advanced technological assets, logistical capacity, and rapid deployment capabilities, making them indispensable partners in disaster response. At the same time, their involvement raises critical concerns regarding the preservation of humanitarian principles such as neutrality, independence, and impartiality (Sandvik et al., 2014).

The dual-use nature of unmanned systems further complicates this dynamic. Technologies originally developed for military applications are increasingly deployed in civilian and humanitarian contexts, blurring

the boundaries between security and humanitarian domains (Clarke, 2014). While this convergence enhances operational capacity, it also introduces risks related to the militarization of humanitarian space and the politicization of aid. Ethical considerations are therefore central to understanding the implications of unmanned systems. The collection and processing of large volumes of data raise concerns about privacy, consent, and surveillance (Finn & Wright, 2016). Furthermore, increasing levels of system autonomy challenge traditional frameworks of accountability, as decision-making processes become partially automated (Sharkey, 2012).

Despite the growing importance of these issues, existing research often treats technological, ethical, and institutional dimensions in isolation. There is a lack of integrative frameworks that capture their interconnections. This study addresses this gap by proposing the Ethical-Operational Integration Model, which conceptualizes the integration of unmanned systems as a multidimensional process shaped by ethical governance, operational coordination, and technological accountability.

By combining theoretical analysis with empirical insights from Indonesia, this study aims to provide a comprehensive understanding of how unmanned systems influence humanitarian missions. Indonesia offers a particularly relevant case due to its high disaster risk and established practices of civil-military collaboration.

RESEARCH METHODS

This study adopts a qualitative research design that integrates a systematic literature review with a case study approach. This methodological strategy is appropriate for examining complex interactions between technological innovation, governance structures, and institutional dynamics (Creswell, 2014). The literature review draws on peer-reviewed publications indexed in Scopus, complemented by reports from international organizations. Sources are selected based on their relevance to key themes, including unmanned systems, humanitarian technology, civil-military cooperation, and ethical governance.

The analytical framework is structured around three interrelated dimensions: ethical governance, operational integration, and technological accountability. These dimensions are conceptualized as interconnected components of a broader system. The empirical analysis focuses on Indonesia, particularly the collaboration between the National Disaster Management Agency and the Indonesian National Armed Forces in utilizing UAVs for disaster response (Lassa, 2018). Secondary data sources, including official reports and academic studies, are used to analyze this case. Data are analyzed using thematic analysis to identify patterns and relationships across sources (Bryman, 2016). The findings are interpreted through the Ethical-Operational Integration Model.

RESULT AND DISCUSSION

The integration of unmanned systems into humanitarian missions represents a structural transformation that reshapes operational practices, governance arrangements, and ethical considerations. Rather than functioning as isolated tools, unmanned systems operate within a complex ecosystem characterized by interdependencies between operational efficiency, institutional coordination, and ethical legitimacy. The Ethical-Operational Integration Model provides a comprehensive framework for understanding these dynamics. One of the most significant impacts of unmanned systems lies in their ability to transform the temporal and spatial dimensions of disaster response. Traditional humanitarian operations are often constrained by delays in data collection and limited accessibility. UAVs address these limitations by enabling real-time data acquisition and rapid situational assessment. This capability allows decision-making processes to shift from reactive to anticipatory modes, enhancing the speed and precision of interventions.

In the Indonesian context, UAV deployment has significantly improved disaster response capabilities. The collaboration between the National Disaster Management Agency and the Indonesian National Armed Forces has enabled rapid mapping of affected areas, infrastructure damage assessment, and identification of vulnerable populations (Hanifa et al., 2022). These advancements have enhanced coordination and reduced response time, demonstrating the operational value of unmanned systems.

However, these benefits are accompanied by significant challenges. The effectiveness of unmanned systems depends on supporting infrastructure, technical expertise, and institutional capacity. In many regions, limitations in connectivity, data processing capabilities, and human resources constrain their full potential. This highlights the importance of sustained investment in both technology and capacity building. Ethical considerations represent a critical dimension of unmanned system integration. The extensive data collection capabilities of UAVs raise concerns about privacy, consent, and data security. Without clear governance frameworks, there is a risk of misuse or unauthorized access to sensitive information (Boyd & Crawford, 2012). These challenges are particularly relevant in disaster contexts, where affected populations may have limited capacity to provide informed consent.

The involvement of military actors further complicates the ethical landscape. While civil-military collaboration enhances operational efficiency, it may also affect perceptions of neutrality and legitimacy. The presence of military institutions, particularly when associated with surveillance technologies, can influence how humanitarian interventions are perceived by local communities (Sandvik et al., 2014). Technological accountability is another key challenge. As unmanned systems become more autonomous, determining responsibility for outcomes becomes increasingly complex. In cases of system failure or unintended consequences, accountability may be distributed across multiple actors, including operators, developers, and decision-makers (Sharkey, 2012).

Institutional dynamics also play a significant role in shaping outcomes. Differences in organizational culture between civilian and military actors can create coordination challenges. Military organizations typically emphasize hierarchical structures and rapid execution, while civilian institutions prioritize participatory approaches and accountability (Kapucu, 2006). Bridging these differences requires the development of shared norms, integrated communication systems, and joint training initiatives. The Ethical-Operational Integration Model highlights that effective integration depends on the alignment of ethical governance, operational coordination, and technological accountability. Weaknesses in one dimension can undermine overall effectiveness, even when other dimensions are strong.

The Indonesian case illustrates both the opportunities and limitations of current practices. While unmanned systems have enhanced operational capacity, gaps remain in governance frameworks, institutional coordination, and technological infrastructure (Lassa, 2018). Addressing these challenges requires a holistic approach that integrates policy development, institutional strengthening, and technological innovation.

CONCLUSION

Unmanned systems have emerged as transformative tools in humanitarian operations, offering new possibilities for enhancing efficiency, safety, and adaptability. However, their integration into civil-military contexts introduces complex challenges that extend beyond technical considerations. This study demonstrates that effective deployment requires a comprehensive approach that integrates ethical governance, operational coordination, and technological accountability. The Ethical-Operational Integration Model provides a valuable framework for understanding these relationships.

The case of Indonesia highlights the importance of balancing technological innovation with ethical and institutional considerations. Strengthening governance frameworks, improving coordination mechanisms, and investing in technological capacity are essential for ensuring responsible and effective humanitarian operations. Future research should focus on empirical validation of the proposed model and comparative analysis across different contexts.

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