



EMERGING TECHNOLOGIES IN MILITARY CONFLICTS – ETHICAL AND LEGAL IMPLICATIONS –

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Technological advancements are radically transforming the conduct of military conflicts. While these innovations offer significant operational advantages, they also raise major ethical and legal challenges. This study examines the impact of emerging technologies on the legitimacy of military actions and the decision-making process, emphasizing the necessity for robust legal and ethical frameworks to ensure compliance with international norms. The military system must align with technological requirements to meet training needs and the dynamics of the operational environment. The integration of Extended Reality (xR) into the decision-making process is essential for a robust and future-ready defence system. The study calls for a nuanced approach to integrating these technologies, balancing technological advantages with ethical obligations.

Keywords: legitimacy of military actions; decision-making processes; autonomous systems; ethical concerns; extended reality; artificial intelligence;

INTRODUCTION

Technological advances are converging towards the intensification of military conflicts through the escalation of arming with technologies. These aspects can generate uncertainty regarding military actions and can complicate the identification of responsibility for potential errors or war crimes. The use of precision weapons and drones, for example, can make military decision-makers perceive war as an easy solution without repercussions, as they can avoid collateral damage and the loss of their own human lives. This technological capability may foster emotional detachment, making the justification of military actions easier and reducing the perceived level of moral responsibility in decision-making.

The following analysis examines the use of modern technologies in warfare through the lens of military implications and adherence to international laws. The significant aspects of modern technologies encompass a wide range of fields, including artificial intelligence (AI), autonomous systems weapons, robotics, cyber warfare, precision-guided munitions, and advanced communication systems. These technological advancements bring significant ethical challenges, particularly regarding the determination of responsibility for actions taken by AI and autonomous systems. In this context, questions arise, such as: *Who is responsible for the actions taken by autonomous weapon systems? What is the impact on human rights and the necessity of protecting civilians? How can we control these technological advancements, especially their proliferation among non-state actors?*

The legitimacy of military actions is fundamentally built, maintained, and sustained through adherence to international legal standards for the use of force, respect for the rule of law, protection of civilians and civilian infrastructure. Legitimacy in military actions encompasses legal, moral, ethical, political, and social dimensions. International debates regarding the legal framework for new technologies, especially autonomous weapon systems, are current and intensely discussed,



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particularly by the International Committee of the Red Cross (ICRC). The persistent issue is *how to apply the set of rules/principles in AI algorithms*. Moreover, the sanctions that can be imposed for non-compliance with these rules, compared to the advantages of using these technologies, are disproportionate, making it even more difficult to control them.

In this brief analysis, based on principles identified from international laws and frameworks developed by the ICRC, we discuss a *“Model of integrating ethical war principles into AI algorithms for autonomous weapon systems”*. This model identifies the principle, the rule, and the way to implement it into the algorithm. Moreover, it can be adapted to new challenges identified through international law and must be used by all AI developers. Besides the autonomous weapons and the discussions surrounding their use on the battlefield, the last part of the paper argues for integrating Extended Reality in the military decision-making process as a component of mission preparation.

This study highlights the critical need for the military system, particularly the Romanian military, to adapt to the rapid advancements in technology, considering both their positive and negative implications. In the context of unstable international security, any delay in updating procedures and adopting emerging technologies can create significant disparities between different armed forces, potentially having major implications for global security.

CLARIFYING TERMINOLOGY IN THE CONTEXT OF EMERGING TECHNOLOGIES

In the context of current discussions about emerging technologies, it is essential to clarify the terminology to avoid confusion between *Artificial Intelligence (AI)*, *Augmented Intelligence (IA)*, *Extended Reality (xR)*, and *Autonomous Weapon Systems (AWS)*. In the specialized literature, these terms are relatively new, creating ambiguity in their usage due to their intersection and complementarity around the concepts of algorithms and augmentation.

The abbreviation *“AI”* is widely recognized and accepted for *Artificial Intelligence*. AI refers to the technology that enables machines to perform tasks that typically require human intelligence, through the use of algorithms and information processing techniques.

Augmented Intelligence – *“IA”* refers to the use of advanced technologies to enhance and extend human capabilities. The primary goal of IA is to assist people in decision-making and performing complex tasks, rather than replacing them. Although the term is often confused with AI, augmented intelligence combines artificial intelligence with human expertise, providing support for data analysis, predictions, and recommendations. It is used in various fields, including medicine, finance, and industry, to improve productivity and accuracy.

“AWS” is a recognized term for *Autonomous Weapon Systems*, which are systems capable of selecting and engaging targets without direct human intervention. Autonomous weapon systems are specific applications that use AI to operate independently, making decisions without human input. The use of this term is common in discussions about the ethics and legality of autonomous weapons.

AI also plays a significant role in *Extended Reality (xR)*, which is an umbrella term covering all technologies that combine real and virtual elements to create interactive and immersive experiences. xR includes *Virtual Reality (VR)*, *Augmented Reality (AR)*, and *Mixed Reality (MR)*. AI enhances xR experiences by optimizing user interactions and personalizing content based on user preferences. For example, AI can adapt the virtual environment in real time to create more effective training scenarios or provide real-time assistance in industrial applications. To ensure clarity and coherence in this article, we will use the following terminological conventions:

- *“AI”* for *Artificial Intelligence*;
- *“IA”* for *Augmented Intelligence*;
- *“AWS”* for *Autonomous Weapon Systems*;
- *“xR”* for *Extended Reality*, including VR, AR, and MR.

THE LEGITIMACY OF MILITARY ACTIONS IN THE CURRENT CONTEXT OF TECHNOLOGICAL EVOLUTION

Legitimacy in military actions refers to the conformity of such actions with nationally and internationally recognized norms, principles and standards. It involves both legal and ethical justification for the use of force, ensuring that the actions taken are seen as acceptable and justified by the international community and the wider



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public. Legitimacy in military actions is crucial as it impacts the perceived justice and support for these actions, both domestically and internationally. Without legitimacy, military actions may face significant opposition, undermine international relations, and lead to long-term conflicts and instability. International Humanitarian Law (IHL), Just War Theory and other ethical frameworks provide moral justification for military actions, making them appear more just. Key principles like just cause, right intention, and proportionality are essential in this regard. This concept is multidimensional and encompasses legal, moral, and social perspectives.

The debate over the legitimacy of military actions in the context of current technological progress is a subject of profound significance and complexity. On the one hand, technological advances have enabled more precise and targeted military operations, reducing the potential for collateral damage and civilian casualties. On the other hand, these advances raise concerns about the disproportionate use of force and the erosion of responsibility in warfare, due to the emotional and moral distancing between those who conduct military operations and their consequences on the civilian population. Additionally, political leaders can make decisions to engage militarily without having to fully assume responsibility for these decisions. For example, in a conflict involving drones with reconnaissance and attack capabilities, political leaders might be tempted to delegate the decision-making authority for attacks to military commanders or even algorithms, thus diminishing their own responsibility. Undoubtedly, with the advent of autonomous military systems, clarity regarding lines of responsibility is diminished.

A recent example that raises questions about legitimacy in actions involving the use of AI algorithms and automated systems can be observed in the Israeli military operations in Gaza (Dombe, 2023). Here, the manner in which certain decisions have been made and the transfer of responsibility between political leaders and military commanders generate ambiguity. The ambiguity regarding responsibility for military actions is accentuated in situations where decisions are made by automated systems. It can lead to questions about *who* is actually responsible for the actions taken – political leaders, military commanders, or software developers. Algorithms can have errors, and decisions based on incorrect or misinterpreted data can lead to serious

consequences, including unintended civilian casualties, which would violate the principles of proportionality and distinction.

A recent investigation reveals that the Israeli military has used an AI-based system, “Lavender”, in operations against Gaza (Yuval, 2024). This system marks tens of thousands of Palestinians as targets with minimal human oversight, leading to significant collateral damage. “Lavender” software was described by officers under the protection of anonymity as having a very permissive approach regarding collateral damage, indicating that it allowed the elimination of a considerable number of civilians depending on the importance of the target. The use of AI-based systems like “Lavender” in Israeli military operations has led to significant civilian casualties in Gaza. According to reports, these technologies allow for more rapid targeting but have resulted in increased collateral damage. Estimates indicate around 15,000 Palestinians have been killed since 7 October 2023, with a significant portion being civilians, including many children and women.

Concerns about responsibility and ethical implications arise as decisions increasingly rely on automated systems. The use of such technology underscores the need for clear legal frameworks and limitations to prevent unintended civilian casualties and ensure responsible military conduct. The use of artificial intelligence systems such as “Lavender” and “Habsora” (known as “Gospel”) by the Israeli armed forces in operations in Gaza highlights the need to establish clear limits and a legal framework for these advanced technologies.

Recent discussions on the international stage about the legitimacy of military actions have often focused on factors such as adherence to international laws, rules of engagement and ethical considerations, which govern how armed conflicts should be conducted to protect civilians and prevent war atrocities. The use of technologies like autonomous or cyber weapons raises numerous questions about human rights, ethics, transparency, and accountability, particularly regarding how they might be integrated within international norms and regulations. Additionally, concerns about increasing power inequalities between state and non-state actors, the risk of escalating conflicts, and the possibility of losing human control over these advanced military technologies are aspects that can influence perceptions of the legitimacy of military actions.



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From a legal perspective, there is a solid basis for applying these essential principles and limiting the effects of armed conflicts on the civilian population by ensuring that military actions are conducted with minimal collateral damage. It means that any use of autonomous weapons and AI algorithms in armed conflicts must adhere to these principles, ensuring that appropriate measures for distinction and proportionality are implemented. However, there is a growing consensus that existing international legislation is insufficient to manage the challenges posed by emerging technologies like AI in military operations. It requires the development of new norms and regulations that align with technological innovations.

It is essential that both states and non-state actors adhere to these legal norms to reduce the human impact of conflicts and promote justice and equity during wars. However, in practice, there are

often difficulties in holding responsible individuals accountable due to the dilution of responsibility through the use of AI algorithms. Therefore, the erosion of responsibility in warfare in the context of technological progress could pose a threat to ethics and justice in armed conflicts, and research and debates on this topic are essential to maintain moral and legal standards in the military field. Clear and adequate regulation of the use of these technologies is crucial to avoid abuses and negative consequences on international security and the civilian population. To maintain ethics and responsibility, many experts suggest that critical decisions, especially those involving human targets, should remain under the strict supervision and control of human operators (United Nations, 2021).

The future of international security will likely be influenced by a combination of traditional and emerging threats, geopolitical shifts, technological advances and global challenges. Cybersecurity, emerging technologies, climate change, geopolitical competition, non-traditional security threats and multilateralism are key factors that will shape the international security landscape in the coming years. Addressing these challenges requires a coordinated global approach and collaboration between governments, international organizations, researchers and civil society.

ADDRESSING ETHICAL AND LEGAL CHALLENGES OF AUTONOMOUS WEAPON SYSTEMS: INTERNATIONAL EFFORTS AND FRAMEWORKS

Numerous international studies, frameworks, and initiatives aim to tackle the ethical and legal challenges posed by autonomous weapon systems (AWS) and ensure their compliance with international humanitarian law (IHL) and ethical standards. For example, the International Committee of the Red Cross (ICRC) has published several reports and papers on the implications of AWS, emphasizing the need for adherence to IHL and ethical considerations. The ICRC report “Autonomous Weapon Systems: Implications of Increasing Autonomy in the Critical Functions of Weapons” (2016) addresses the legal and ethical challenges of AWS.



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Similarly, the United Nations Institute for Disarmament Research (UNIDIR) has conducted extensive research on AWS, producing reports such as “The Weaponization of Increasingly Autonomous Technologies: Autonomous Weapon Systems and Cyber Operations” (2017), which examines the ethical and legal dimensions of AWS. The Stockholm International Peace Research Institute (SIPRI) has also published numerous studies on the development and implications of AWS, including discussions on legal and ethical frameworks.

Several international organizations are working to address the challenges posed by AWS. The Group of Governmental Experts (GGE) on Lethal Autonomous Weapons Systems (LAWS) under the Convention on Certain Conventional Weapons (CCW) has been discussing the legal, ethical, and operational implications of AWS since 2014. In 2024, the GGE convened to continue these discussions and developed guiding principles for AWS development and use, emphasizing human control and IHL compliance. The UN Office for Disarmament Affairs (UNODA) facilitates these discussions, providing resources and support for AWS regulation (CCW, 2024).

While not specific to AWS, the Asilomar AI Principles, developed during the *Asilomar Conference on Beneficial AI* in 2017, provide guidelines for the ethical development and deployment of AI technologies, including ensuring transparency, accountability, and avoiding AI arms races (<https://futureoflife.org/event/bai-2017/>). The *Ethics Guidelines for Trustworthy AI*, developed by the European Commission’s High-Level Expert Group on AI, emphasize ethical principles such as respect for human autonomy, prevention of harm, fairness, and explicability. Although these guidelines focus on AI broadly, they are relevant to the development and use of AWS.

National and international initiatives also contribute to addressing the ethical challenges of AWS. The *Campaign to Stop Killer Robots* (<https://www.stopkillerrobots.org/>), a global coalition of non-governmental organizations, advocates for a pre-emptive ban on fully autonomous weapons. This campaign emphasizes ethical concerns and stresses the importance of maintaining human control over the use of force. The *Tallinn Manual on the International Law Applicable*

to *Cyber Warfare*, although primarily focused on cyber operations, offers insights into how international law applies to autonomous systems, including AWS, in the context of armed conflict.

These studies, frameworks, and initiatives collectively contribute to the ongoing international dialogue on ensuring that AWS are developed and used in a manner that respects international rules of legitimacy and ethical standards. They emphasize the importance of human oversight, accountability, compliance with IHL, and minimizing harm to civilians. The international community continues to work towards establishing robust regulatory and ethical frameworks to address the complex challenges posed by AWS.

ETHICAL CONSIDERATIONS FOR AUTONOMOUS WEAPONS SYSTEMS (AWS)

The advancement of chip technology, along with aggressive gadget marketing, has intensified the technological arms race in both civilian and military sectors, leading to the advent of a new form of warfare characterized by autonomous weapons. This accelerated development has created significant disparities between technological advancements in the civilian sector across different global regions and among various military forces. If these gaps are not quickly addressed through investments in technology and strict regulations regarding their use in the civil sector, it could have unpredictable consequences. Specifically, access to these technologies by organized crime and terrorist entities could undermine global efforts in diplomacy and arms control.

Autonomous weapons systems (AWS), often referred to as lethal autonomous weapons systems (LAWS), are military systems capable of selecting and engaging targets without direct human intervention. These systems can operate based on advanced artificial intelligence algorithms and make real-time decisions on the battlefield. Such technologies may include drones, terrestrial robots, or autonomous naval and aerial systems. Autonomous weapons are designed to enhance response capabilities and combat efficiency while reducing risks for human soldiers. Their primary advantages include superior



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reaction speed, the ability to operate in dangerous or inaccessible environments, and the capability to execute complex missions with increased precision. However, their use also raises numerous ethical and legal concerns, including issues related to accountability in cases of errors or misuse and their impact on international warfare norms. Just War Theory and other ethical frameworks provide moral justification for military actions, making them appear more just. Key principles such as just cause, right intention, and proportionality are essential in this regard, especially as AWS become increasingly integrated into military strategies. Global discussions surrounding these weapons focus on the need for regulation and control, as well as the potential consequences of uncontrolled proliferation of these advanced technologies.

One of the fundamental ethical concerns with AWS is the potential erosion of human oversight in *life-and-death* decisions. Human judgment is crucial in military operations to ensure compliance with international humanitarian law (IHL) and to uphold ethical standards. The complexity and unpredictability of autonomous systems make it difficult to guarantee that these systems will always act within legal and ethical boundaries. Therefore, maintaining human control – particularly through *human-on-the-loop supervision* – is essential to mitigate the risks associated with autonomous decision-making. Supervisory control means having situational awareness, sufficient time to intervene, and a mechanism to take back control or deactivate the system if necessary. This mechanism could be a communication link or physical controls (ICRC, 2019).

Accountability in the use of lethal force is a cornerstone of both legal and ethical military conduct. Autonomous systems, by their nature, complicate the assignment of responsibility. If an AWS mistakenly targets civilians or commits a war crime, it is unclear who would be held accountable – the developer, the operator, or the commanding officer. This ambiguity undermines the principles of justice and accountability. Robust legal frameworks and clear lines of responsibility must be established to address these issues effectively (Cernat, 2022).

The proliferation of AWS increases the likelihood of these technologies falling into the hands of non-state actors, which could use them in ways that exacerbate conflicts and violate international norms.



This proliferation risk is compounded by the potential for these systems to be used in ways that lower the threshold for initiating conflict, as the human cost of war is perceived to be reduced. International cooperation and stringent export controls are necessary to prevent the misuse and uncontrolled spread of AWS. (ICRC, 2019).

As we look to the future, the ethical considerations surrounding AWS extend beyond immediate military applications to broader societal implications. The development and deployment of AWS must be guided by an ethical framework that prioritizes human dignity, accountability, and the preservation of peace.

The deployment of AWS raises significant ethical concerns about the dehumanization of warfare and the potential for moral disengagement. The use of robots and AI in combat may create a psychological and moral distance between decision-makers and the consequences of their actions, leading to a “*moral buffer*” effect. This detachment can result in less stringent adherence to ethical norms and a greater likelihood of collateral damage. Societal attitudes towards warfare could also shift, normalizing the use of automated systems in conflict and reducing the impetus for peaceful resolution of disputes (ICRC, 2014).

To ensure that AI algorithms used in autonomous weapons systems (AWS) respect international rules of legitimacy in military actions, several essential rules and principles must be implemented. These rules should align with international humanitarian law (IHL) and ethical frameworks such as Just War Theory. Building on the identified rules and principles, a diagram has been created to model these principles, the associated rules, and their implementation in Autonomous Weapons Systems (AWS) algorithms.

Discussions in this field are current and highly dynamic, especially with the public release of AI. The proposed model is also dynamic and must be continuously adjusted to address identified issues. It is crucial that a model of AI algorithms with standard principles should be implemented internationally, without ambiguities (United Nations, 2021).

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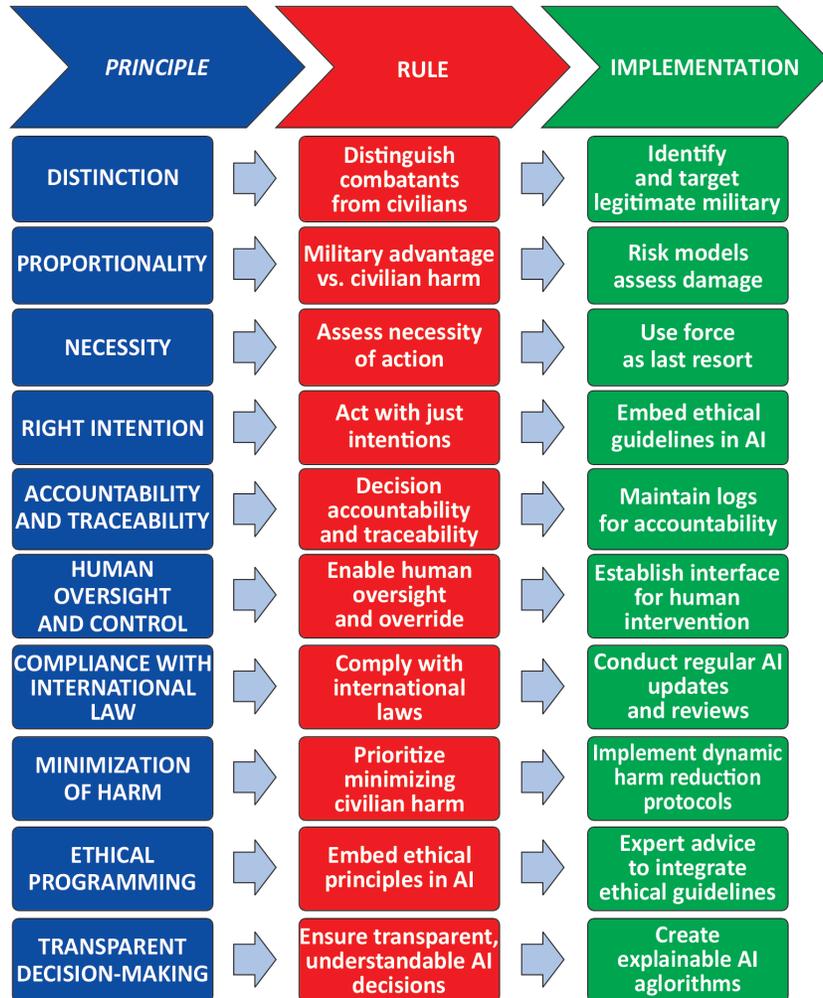


Figure 1: Model for Integrating Ethical War Principles into AI Algorithms for Autonomous Weapon Systems (authors' design)

For this model of integrating ethical war principles into AI algorithms for autonomous weapon systems, a set of moral guidelines and rules has been established to ensure that military actions are conducted in a just, humane manner, and in accordance with international laws and norms. The details of these principles, along with their application within this model, are outlined as follows:

1. Distinction

- **Rule:** The AI must be able to distinguish between combatants and non-combatants, as well as between military objectives and civilian objects.



- **Implementation:** Algorithms should include advanced object recognition and context analysis to identify and target only legitimate military targets.

2. Proportionality

- **Rule:** The AI must ensure that the anticipated military advantage of an attack is not outweighed by the potential harm to civilians and civilian infrastructure.
- **Implementation:** Algorithms should incorporate risk assessment models to evaluate potential collateral damage and avoid disproportionate use of force.

3. Necessity

- **Rule:** The AI must determine whether a military action is necessary to achieve a legitimate military objective.
- **Implementation:** Decision-making protocols should ensure that force is used only when absolutely necessary, considering all other non-violent alternatives.

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4. Right Intention

- **Rule:** The AI must act with the intention of achieving a just and legitimate outcome, not for malicious purposes or unnecessary harm.
- **Implementation:** The algorithm must include validation modules for each ethical principle in the proposed model that function as checkpoints within the decision-making flow, allowing progress only if all ethical principles are respected.

5. Accountability and Traceability

- **Rule:** There must be clear accountability and the ability to trace and review decisions made by AI systems.
- **Implementation:** Logs and audit trails must be maintained, recording all decisions and actions taken by the AI for post-action analysis and accountability.

6. Human Oversight and Control

- **Rule:** Human operators must have the ability to oversee and, if necessary, override AI decisions.
- **Implementation:** Interfaces and protocols must be established to allow human intervention at critical decision points, ensuring final human judgment in the use of force.



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7. Compliance with International Law

- **Rule:** The AI must comply with all applicable international laws, including treaties and customary international law.
- **Implementation:** Regular updates and reviews of AI systems must be conducted to ensure they are in line with current legal standards and norms.

8. Minimization of Harm

- **Rule:** The AI must prioritize minimizing harm to civilians and civilian objects.
- **Implementation:** Incorporate harm minimization protocols that dynamically adjust tactics to reduce potential damage and casualties.

9. Ethical Programming

- **Rule:** Ethical principles should be embedded within the AI's core programming.
- **Implementation:** Interdisciplinary collaboration involving ethicists, legal experts, and technologists to develop and integrate ethical guidelines into the AI's decision-making processes.

10. Transparent Decision-Making

- **Rule:** The AI's decision-making processes must be transparent and understandable to human operators.
- **Implementation:** Develop algorithms that provide explanations for their decisions, ensuring that human operators can understand the rationale behind actions taken by the AI.

Implementing these rules and principles into AI algorithms for AWS not only enhances the legitimacy of military actions involving AI but also helps to maintain international peace and security, while protecting human rights and dignity. Robust testing, continuous oversight, and regular updates are critical to maintaining the integrity and effectiveness of these AI systems in military applications.

OPTIMIZED MILITARY DECISION-MAKING PROCESS THROUGH EXTENDED REALITY (xR)

The positive impact of technological advancements on societal development is undeniable, influencing everything from recreational activities to simplifying daily tasks through their integration into everyday routines. The security sector must also evolve to meet these societal demands. Moreover, concerns regarding the ethics and legitimacy of algorithms employed in autonomous weapons systems are well-founded and require careful consideration.

The younger generation increasingly views the traditional military system as technologically outdated and lacking in job satisfaction. This perception can be addressed by leveraging their advanced technological skills, which are honed through regular interaction with gadgets and video games. By overhauling the current training system, the military can become an appealing career choice for intellectually gifted young individuals.

Furthermore, integrating advanced technologies into military training can bridge the gap between the digital proficiency of young recruits and the demands of modern military operations. This alignment can lead to a more competent and satisfied workforce, better prepared to handle the complexities of contemporary security challenges. Thus, embracing technological advancements in military training is not just beneficial but essential for creating a robust and future-ready defence system.

The US Center for Army Lessons Learned (CALL) emphasizes the importance of using wargaming in the tactical and strategic decision-making process, as outlined in the manual titled *“Military Decision-Making Process”* (MDMP) (CALL, 2023). According to lessons learned over the years, war-gaming is an essential component of the MDMP, enhancing personnel effectiveness and preparedness by allowing commanders to visualize and analyse courses of action. During war-gaming, the staff examines the potential actions, reactions, and counteractions of all participants, including allied forces, enemy forces and civilians. This process facilitates the identification of strengths and weaknesses in each Course of Action (COA), leading to necessary adjustments. (Zygar, 2023)



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War-gaming has been used by the US military since 1916 and has been continuously refined and integrated into training and operational programmes to adapt to new requirements and technologies. Over the decades, simulation methods have evolved from maps and physical pieces to complex digital simulations, providing an increased level of realism and detail. These improvements have allowed the military to more accurately anticipate enemy reactions and develop more effective strategies.

In recent years, Extended Reality (xR) technologies, which include Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), have also been incorporated into military training. These technologies create immersive environments where trainees can engage in realistic 3D simulations, such as piloting aircraft or performing medical procedures, thus reducing real-world risks. xR enhances the visualization of the battlefield, allowing for detailed views of terrain, enemy positions, and potential hazards. Additionally, xR supports real-time, collaborative planning sessions with geographically dispersed teams, ensuring that all relevant stakeholders can contribute to the decision-making process. This integration of xR technologies into wargaming and other training methods has further improved the effectiveness and readiness of military personnel (Freedman, 2019).

One argument in favour of this technological adaptation is the potential for enhanced engagement through the use of digital extended reality technologies. These technologies can revolutionize training programmes by providing diverse and immersive learning methods, such as interactive lessons, modules, and personalized training sessions. This approach makes learning not only more engaging but also more effective, as it caters to individual learning styles and needs.

According to the *Cone of Learning* developed by Edgar Dale in 1946, also known as the *Cone of Experience* (Growth, 2024), the human brain retains more information by what they “do” as opposed to what they “hear”, “read”, or “observe”.

The *Cone of Learning* emphasizes the importance of active participation and experiential learning. According to Dale, engaging multiple senses while actively participating in the learning process leads to better retention and understanding. Utilizing Extended Reality

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(xR) technologies can effectively create these immersive and interactive learning environments. This approach aligns with Dale’s principles, enhancing retention and understanding by engaging multiple senses and facilitating active participation.

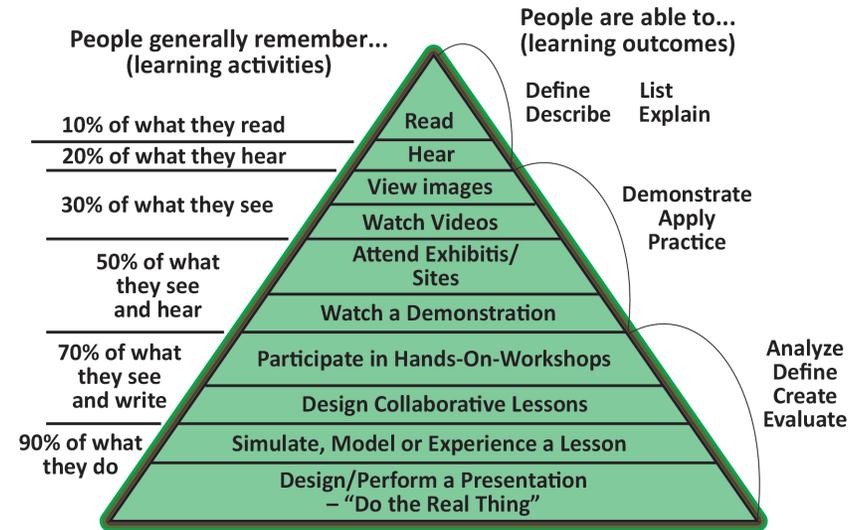


Figure 2: Cone of Learning example
 (https://commons.wikimedia.org/wiki/File:Edgar_Dale%27s_cone_of_learning.png, Jeffrey Anderson)

Over-reliance on xR technology could lead to vulnerabilities. If the technology fails (due to cyber-attacks or technical issues), decision-making processes could be severely disrupted.

Moreover, xR can integrate data from various sources (e.g., drones, satellites, ground reports) in real time, providing a comprehensive operational picture. This data-rich environment supports more accurate and legitimate decision-making. Continuous training using xR can help military personnel to quickly adapt to new technologies and tactics, ensuring that they are always operating at peak efficiency and effectiveness.

However, over-reliance on xR technology could lead to vulnerabilities. If the technology fails (due to cyber-attacks or technical issues), decision-making processes could be severely disrupted. The immersive nature of xR can sometimes lead to cognitive overload, where the sheer amount of information available can overwhelm decision-makers, potentially leading to poor decisions.

While xR can simulate many scenarios, it can never fully replicate the complexities and unpredictability of real-life situations.



Overconfidence in simulated outcomes might lead to decisions that are not well-suited for actual conditions. The scenarios and data used in xR simulations can be biased based on the inputs and design choices. It could lead to skewed perceptions and potentially illegitimate decisions if not carefully managed.

The use of Extended Reality (xR) enhances the decision-making process and bolsters the legitimacy of military actions through realistic simulations and comprehensive data integration. As a valuable tool in modern military decision-making, xR can improve the legitimacy and effectiveness of military operations in the context of current technological advancements. However, excessive reliance on this technology may lead to ethical concerns and operational risks.

CONCLUSIONS

The study highlights a significant transformation in modern warfare driven by technological advancements such as artificial intelligence (AI), autonomous weapon systems (AWS), and virtual reality (VR) training.

On the one hand, while these technologies can enhance precision and operational effectiveness, they simultaneously present ethical and legal challenges that require careful management. The analysis emphasizes the potential erosion of responsibility and accountability as decision-making processes shift from humans to algorithms, which can lead to a detachment from the consequences of military actions, potentially resulting in unjustified actions and an increase in civilian casualties.

Illustrating the complexity of balancing technological capabilities with ethical obligations, the use of AI in Israeli military operations in Gaza demonstrates the necessity for robust legal frameworks and clear lines of responsibility. The AI-based “Lavender” system, which led to significant collateral damage, underscores this crucial point.

It is imperative to maintain human oversight and control over autonomous systems to mitigate risks and uphold ethical standards. AI algorithms for AWS must incorporate principles such as distinction, proportionality, necessity, and accountability to align with ethical and legal norms. The model for integrating the principles of the ethics

of war into AI algorithms for autonomous weapon systems, as presented in the study, proposes the use of regulatory frameworks that include continuous verification of algorithmic decisions through simulations and complex scenarios to ensure compliance with rules of engagement and international laws of armed conflict. This model emphasizes the importance of transparency and auditability in the development and implementation of AI, so that any decision made by autonomous systems can be reviewed and validated by human decision-makers.

International efforts, including frameworks developed by the International Committee of the Red Cross and the United Nations Institute for Disarmament Research, are essential in addressing the ethical and legal challenges associated with AWS. These initiatives aim to establish guidelines for the responsible use of advanced military technologies, protecting civilian lives and promoting justice.

The integration of technological advancements in warfare requires a nuanced approach that balances operational advantages with ethical and humanitarian obligations. Continuous research, international cooperation and stringent regulation are imperative for navigating the complexities of modern warfare, ensuring that technological progress does not compromise human rights and international stability.

BIBLIOGRAPHY:

1. Arkin, R. (2009). *Governing Lethal Behavior in Autonomous Robots*. New York: CRC Press.
2. Bendett, S. (2022). *The Role of Iranian-Made Shahed-136 Drones in Russian Military Strategy*. In *Journal of Strategic Studies*, pp. 489-510.
3. Center for Army Lessons Learned (CALL). (2023). *Military Decision – Making Process organizing and conducting planning*, US Army: <https://api.army.mil/e2/c/downloads/2023/11/17/f7177a3c/23-07-594-military-decision-making-process-nov-23-public.pdf>, retrieved on 10 May 2024.
4. Cernat, R. (2022). *Sistemele de arme autonome letale – tehnologie emergentă și potențial nimicitoare*. In *Romanian Military Thinking International Conference Proceedings*, pp. 156 -174.
5. Chatelier, P.R., Seidel, R. (2013). *Virtual Reality, Training's Future? Perspectives on Virtual Reality and Related Emerging Technologies*. Germany: Springer.



The model for integrating the principles of the ethics of war into AI algorithms for autonomous weapon systems, as presented in the study, proposes the use of regulatory frameworks that include continuous verification of algorithmic decisions through simulations and complex scenarios to ensure compliance with rules of engagement and international laws of armed conflict.



6. Convention on Certain Conventional Weapons/CCW (2024). *Group of Governmental Experts of the High Contracting Parties related to emerging technologies in the area of lethal autonomous weapons systems (LAWS)*, UNODA, <https://meetings.unoda.org/ccw-/convention-on-certain-conventional-weapons-group-of-governmental-experts-on-lethal-autonomous-weapons-systems-2024>, retrieved on 20 May 2023.
7. Dombe, A.R. (February 2023). *Commander of the Artificial Intelligence Center, 8200: Artificial intelligence enables faster classification and detection of terrorist targets*, Israel Defense Web: www.israeldefense.co.il/node/57256#google_vignette, retrieved on 15 April 2024.
8. Freedman, J. (2019). *Using VR in the Military*. United Kingdom: Cavendish Square.
9. Galeotti, M. (2023). *Drone Warfare and the Russian Military: Lessons from the Ukraine Conflict*. In *Military Review*, pp. 112-126.
10. Growth (2024), <https://www.growthengineering.co.uk/what-is-edgar-dales-cone-of-experience>, retrieved on 22 May 2024.
11. ICRC (2019). *Autonomy, Artificial Intelligence and Robotics: Technical Aspects of Human Control*, pp. 2-9, https://www.icrc.org/sites/default/files/document/file_list/autonomy_artificial_intelligence_and_robotics.pdf, retrieved on 10 April 2024.
12. ICRC. (1977). *Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I) art. 51(5)(b), art. 57*. International Humanitarian Law Databases, <https://ihl-databases.icrc.org/en/ihl-treaties/api-1977>, retrieved on 10 March 2024.
13. ICRC (26-28 March 2014). *Report of the ICRC Expert Meeting on 'Autonomous weapon systems: technical, military, legal and humanitarian aspects'*. Geneva, <https://www.icrc.org/sites/default/files/external/doc/en/assets/files/2014/expert-meeting-autonomous-weapons-icrc-report-2014-05-09.pdf>, retrieved on 20 April 2024.
14. IEEE SA. (n.d.). *IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems. „Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems, First Edition”*, <https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/ead1e.pdf>, retrieved on 12 March 2024.
15. Rojansky, M., Kofman, M. (2022). *The Impact of Technological Integration on Russian Military Tactics in Ukraine*. In *Foreign Affairs*, pp. 67-84.
16. Scharre, P. (2018). *Army of None: Autonomous Weapons and the Future of War*. New York: W.W. Norton.

17. Scharre, P. (2018). *Autonomous Weapons and Operational Risk*. In *The Ethics of Autonomous Weapons*, pp. 23-399. New York: Oxford University Press.
18. Singer, P.W. (2009). *Wired for War: The Robotics Revolution and Conflict in the 21st Century*. New York: Penguin Press.
19. United Nations (2021). *Lethal Autonomous Weapon Systems: Legal, Ethical, and Operational Issues*. New York: United Nations.
20. Walsh, T. (2018). *Machines That Think: The Future of Artificial Intelligence*. New York: Prometheus Books.
21. Walzer, M. (2006). *Just and Unjust Wars: A Moral Argument with Historical Illustrations*. Basic Books.
22. Warrick, J. (2022). *From Theory to Practice: The Real-Time Implementation of Drone Warfare Tactics in Ukraine*. In *The Washington Quarterly*, pp. 93-109.
23. Williams, A. (2021). *Autonomous Systems: Legal and Ethical Challenges*. New York: Routledge.
24. Yuval, A. (2024). *'Lavender': The AI machine directing Israel's bombing spree in Gaza*, <https://www.972mag.com:https://www.972mag.com/lavender-ai-israeli-army-gaza/>, retrieved on 15 April 2024.
25. Zygar, M. (2023). *Adapting to the Battlefield: The Evolution of Russian Military Strategy in the Face of Technological Change*. In *International Journal of Military History and Historiography*, pp. 75-94.
26. <https://futureoflife.org/event/bai-2017/>. *Beneficial AI 2017*, retrieved on 12 June 2024.
27. https://commons.wikimedia.org/wiki/File:Edgar_Dale%27s_cone_of_learning.png, Jeffrey Anderson, retrieved on 12 June 2024.
28. <https://www.stopkillerrobots.org/>; <https://una.org.uk/what-we-do/campaign-stop-killer-robots>, retrieved on 12 June 2024.