The transformation of military strategy: The role of artificial intelligence in contemporary warfare and its implications for future conflicts

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Abstract

Recent advancements in artificial intelligence have significantly influenced various sectors, with profound implications for military operations. As warfare becomes increasingly complex, the integration of artificial intelligence technologies presents both strategic opportunities and ethical challenges. Despite growing academic and strategic interest, there remains limited understanding of how artificial intelligence, particularly autonomous systems such as combat drones, is reshaping the dynamics and strategies of modern warfare. This study examines the transformative impact of artificial intelligence on military operations, focusing on the evolution of combat strategies, decision making processes, and the shifting role of human involvement. Through conceptual analysis, the study explores the emergence of new domains of warfare, including cyber operations, information operations, and the deployment of autonomous systems, within the broader context of global digital transformation. Drawing on the concept of the revolution in military affairs, it highlights a transition from the enhancement of military equipment to the replacement of human roles with intelligent systems. The findings emphasize a change not only in tactical procedures but also in reasoning processes related to conflict. The study concludes with a critical assessment of whether the benefits of increased efficiency and precision outweigh the potential risks to international norms and the escalation of armed conflict.

Keywords: Artificial intelligence; future conflict; military transformation; warfare

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1.   INTRODUCTION

In his 1950 article titled "Computing Machinery and Intelligence," published in the journal Mind, Alan Turing posed the provocative question, "Can machines think?" (Turing, 1950); This inquiry aimed to clarify the understanding of autonomous learning processes and laid the groundwork for artificial intelligence research. Over the past decade, investments and incentive mechanisms for AI research have significantly increased, positioning the human-AI dichotomy as one of the most prominent divides of the 21st century. It is believed that artificial intelligence, which has the potential to restructure humanity and the human mind unchanged throughout historical processes of economic, social, and political revolutions may signal the beginning of a new era (Coppi et al., 2021; Buchanan, 2005; Khanal et al., 2024). Discussions surrounding the effects of AI are shaped by themes such as the potential for AI to replace humans in nearly every field and the risk of uncontrolled AI proliferation. Following the First Industrial Revolution, the need for human intelligence to guide machines persisted. However, the digital transformation brought about by the Fourth Industrial Revolution is expected to alter the role of human intelligence in this process with the notion that an artificial intelligence at human levels may perform any task better than a human could.

Artificial intelligence (AI) research, often viewed solely as a technological advancement, possesses the potential to transform the social realm that underpins national and international politics, thereby creating a new policy-making arena for decision-makers (Lingevicius, 2023). Due to the robotic revolution in military technologies, the nature of power usage and the future of warfare are beginning to shift with AI research anticipated to introduce a new dimension to military competition (Centeno et al., 2023; Boudreaux et al., 2020). Developments in unmanned aerial vehicles (UAVs) represent the most visible aspect of this process, which is shaped by discussions around the degree to which humans will be involved in decision-making cycles of power usage, particularly through the lens of semi-autonomy versus full autonomy. For instance, the Northrop Grumman X-47B UAV successfully completed a flight path determined by humans without any further intervention in 2011, illustrating significant advancements in autonomous capabilities. Similarly, Israel Aerospace Industries has also been at the forefront of these developments.

The incorporation of AI into military activities represents a significant change in how wars are conducted, altering how decisions are made and how effective operations are carried out. AI systems improve awareness of situations, helping forces quickly analyze large amounts of data to enable timely responses in dynamic combat settings. This advancement in technology brings about intricate ethical dilemmas, especially regarding accountability and moral responsibility in times of conflict. Recent analyses have pointed out that using human-AI teams raises important issues regarding who is to blame for harm to civilians and the possibility of operators feeling disconnected or experiencing moral injury in the face of more intense moral dilemmas. Moreover, the changing nature of contemporary conflicts, which involve hybrid and asymmetric warfare, requires a reassessment of conventional military doctrines and ethics. In the end, it is essential to grasp the significance of AI in shaping future conflicts for both military effectiveness and the preservation of humanitarian principles in warfare.

1.1. Purpose of the study

This study aims to explore the transformative impact of artificial intelligence on military operations, focusing on the ways it reshapes combat strategies, decision-making processes, and the evolving role of human involvement. With the increasing complexity of modern warfare, AI, particularly autonomous systems like combat drones, offers both strategic opportunities and ethical challenges. The study will examine the emergence of new domains of warfare, such as cyber operations, information warfare, and the deployment of autonomous systems, all within the broader context of global digital transformation. The central objective is to critically assess the shift from enhancing military equipment to potentially replacing human roles with intelligent systems, and the implications this has for both tactical procedures and reasoning processes in warfare. By evaluating whether the

benefits of AI-driven efficiency and precision outweigh the risks to international norms and the potential for escalated conflict, the study will contribute to the ongoing discourse on AI's role in reshaping military operations.

2. METHOD AND MATERIALS

The methodology of this study involves a comprehensive review of academic papers, military documents, and strategic analyses to assess the current state of AI technologies in military applications. This review will focus on identifying key themes, theoretical frameworks, and research gaps within the existing literature. To further illustrate the practical applications of AI in military settings, the study will employ case studies that highlight recent uses of autonomous drones and AI-powered intelligence systems in military conflicts. These case studies will examine operational results, tactical advancements, and strategic shifts resulting from AI integration. Additionally, the study will address the ethical and legal concerns surrounding the deployment of AI in warfare, particularly issues related to accountability, decision-making processes, and compliance with international humanitarian law. Finally, the study will analyze military doctrines and strategies from various nations regarding the integration of AI into their armed forces, aiming to identify the diverse ways in which AI can impact international security dynamics. This multifaceted approach will provide a thorough understanding of how AI is reshaping modern warfare, including its potential advantages and challenges for future conflicts.

3. RESULTS

The integration of artificial intelligence into military operations marks a significant shift in how tactical decision-making and operational planning are carried out. Traditional military strategies relied heavily on human intelligence and manual calculations, which were often time-consuming and prone to errors in high-pressure environments. AI systems, however, provide a game-changing advantage by processing vast amounts of data in real time. This capacity to analyze and interpret large datasets enables military commanders to make swift and well-informed decisions, a crucial factor when responding to dynamic and rapidly changing battlefield conditions. For example, AI-driven systems can analyze surveillance data, detect potential threats, and recommend strategic responses almost instantaneously, improving the overall decision-making process and reducing the time gap between threat detection and response.

One area where AI has demonstrated its significant impact is in resource allocation during complex military operations. Research from the Naval Postgraduate School highlights how AI can facilitate multi-mission resource allocation across different naval platforms. Military operations often require concurrent missions across various domains such as land, sea, and air, and coordinating these missions efficiently is a critical challenge. AI-enhanced systems can assess the current operational environment and reallocate resources in real time to ensure optimal performance across all fronts. This capability helps military planners maximize the efficiency of available resources and address competing priorities, whether in the context of convoy protection using directed energy or providing aviation support during airstrikes. AI's ability to optimize resource distribution ensures that military forces can maintain high operational tempo, even in complex scenarios that involve multiple variables and uncertain conditions.

In addition to improving decision-making and resource allocation, AI also contributes to dynamic replanning capabilities, which are essential in modern warfare. Systems engineering in AI tools enables military planners to adapt quickly to changing conditions on the ground by adjusting plans and reassigning resources in response to new intelligence or evolving threats. The flexibility and adaptability of AI-driven systems ensure that military forces can remain agile in the face of unexpected developments. Studies analyzing the multi-mission resource allocation (MMRA) problem set show that AI-based solutions can continuously assess mission parameters and adjust resource distribution to meet shifting priorities. This dynamic replanning capability is crucial for staying ahead of adversaries who may introduce new tactics or escalate conflicts unpredictably. Overall, the application of AI in military operations not only enhances operational effectiveness but also prepares armed forces to navigate the increasing complexity and unpredictability of modern warfare.

Upon reviewing the existing literature in the context of the research questions, it becomes apparent that the integration of artificial intelligence (AI) in the military domain remains an emerging field rather than a fully developed and mature area of study. Despite significant advances in AI technology, its application within military operations is still in the exploratory stages. This nascent nature of AI in the military raises concerns regarding the potential for regulatory frameworks to adequately address the challenges posed by such technologies. At present, many efforts to regulate or control AI in warfare remain insufficient, primarily due to the complexity and rapid evolution of AI systems, which often outpace legislative and policy-making processes. This gap between technological development and regulation highlights the pressing need for more robust and forward-thinking governance structures to address the unique risks associated with AI in military contexts.

A significant challenge to forming comprehensive regulations is the influence of popular culture, which often portrays AI in military applications through the lens of dystopian narratives, particularly focusing on the concept of "killer robots." These depictions, often sensationalized in media and film, contribute to a public perception that AI in warfare is inherently dangerous and uncontrollable. As Kumar and Batarseh (2020) argue, this portrayal fosters an overly pessimistic and sometimes irrational view of AI's potential role in military conflicts. The emphasis on autonomous weapons systems as "killer robots" risks obscuring the nuanced and multifaceted nature of AI technology. In reality, AI could offer both strategic advantages and significant challenges, and it is crucial to move beyond the sensationalist depictions to engage with the complex ethical, legal, and practical implications of AI in warfare.

Further complicating the regulatory landscape is the debate surrounding the potential international ban of fully autonomous weapon systems, which can operate without human involvement in the decision-making process. Many scholars and policymakers believe that such a ban is essential to preventing AI-driven warfare from spiraling out of control. However, recent arguments suggest that the imposition of a global ban on autonomous weapons systems may be both unrealistic and ineffective. Pekarev (2023), Bächle and Bareis (2022) argue that banning such technologies may not be practical, as states may continue to develop and deploy autonomous systems covertly, or within countries that reject such bans. Moreover, the effectiveness of international agreements in curbing the proliferation of AI weapons is questionable, especially given the competitive nature of global military advancements. The complexity of enforcing such a ban, coupled with the diverse political interests of different nations, challenges the notion that a universal prohibition on autonomous weapon systems is feasible or desirable.

The core assumption of this study is that AI research has the potential to fundamentally transform the nature of power dynamics and military strategy. The ongoing discussions about autonomy in military systems are not merely technical debates; they represent a shift in the conceptualization of warfare itself. The move toward increased autonomy in military systems could lead to a reduction in human agency, making decisions and operations more reliant on AI algorithms rather than human judgment. As Brundage et al. (2018) contend, the rise of fully autonomous systems could result in an irreversible shift in how warfare is conducted, potentially making human involvement in critical decision-making processes obsolete. This shift raises important ethical and operational questions about accountability, the role of human oversight, and the risks of ceding control to machines. The increasing autonomy of military technologies could challenge the very foundation of military ethics, where human decision-making has traditionally played a central role, leading to complex moral dilemmas regarding responsibility and accountability in armed conflict.

4. CONCLUSION

Technological advancements in the military domain are rapidly altering political decision-making mechanisms and shifting the understanding of ethics and acceptability in warfare. In traditional warfare, political decisions regarding the use of force and military interventions have been heavily influenced by human judgment, ethical considerations, and the political will of national leadership. However, with the increasing reliance on advanced

technologies like artificial intelligence (AI) in military systems, these decision-making processes are undergoing a significant transformation. AI systems, equipped with the ability to process vast amounts of data and make rapid decisions, have the potential to reshape the way military forces assess threats, deploy resources, and engage in combat. The integration of AI into military strategy introduces a level of complexity that challenges existing political and ethical frameworks. These changes underscore the need for new political structures and ethical guidelines that are adaptable to the evolving nature of warfare in the digital age.

As military tactics evolve with technological advancements, the integration of autonomous systems such as drones, robotic soldiers, and AI-driven intelligence platforms introduces new operational dynamics. These systems can perform complex tasks more efficiently than human soldiers, providing significant advantages in terms of speed, precision, and the ability to operate in hostile or inaccessible environments. However, these same capabilities also raise profound ethical concerns, particularly in regard to accountability and decision-making authority. Autonomous systems, governed by algorithms, are increasingly capable of making life-or-death decisions on the battlefield without direct human intervention. While these systems may improve operational effectiveness by making faster, data-driven decisions, they also present the risk of errors or unintended consequences, such as misidentifying targets or failing to adhere to rules of engagement. The complexity of these ethical dilemmas is compounded by the fact that these systems operate on algorithms that may not be fully transparent or understandable to human operators, further obscuring the accountability of military actions.

One of the most pressing concerns regarding the use of autonomous military systems is the question of accountability in the event of an error or a violation of international laws. In traditional warfare, responsibility for military actions rests with human commanders, who are expected to adhere to rules of engagement and international humanitarian law. However, when AI systems are tasked with making critical decisions, determining responsibility for any misstep becomes far more difficult. For example, if an autonomous drone mistakenly targets civilians instead of combatants, who is responsible for the attack? Is it the military commanders who deployed the system, the developers who programmed the algorithm, or the AI itself? This lack of clarity regarding accountability poses a significant challenge to the principles of justice and fairness in warfare, and highlights the need for robust regulatory frameworks that can address these complexities. Without clear lines of accountability, the risk of violating international laws or committing war crimes increases, raising serious ethical concerns about the legitimacy of using AI in military operations.

In addition to the challenge of accountability, the rapid pace of technological advancements in military systems presents a further complication: the accelerating pace of warfare itself. As AI technologies enhance the speed and efficiency of military operations, decision-making processes must keep up with the rapidly changing environment. In traditional warfare, military operations often unfolded at a slower pace, with ample time for human commanders to assess situations, weigh options, and consult with advisors. In contrast, AI-powered systems operate in real-time, analyzing vast amounts of data and responding to threats within fractions of a second. This increased speed of decision-making has the potential to outpace human judgment, leading to situations where decisions are made too quickly for proper ethical or legal considerations to be applied. In a rapidly changing battlefield, the ability of military forces to adapt and respond becomes more crucial, but so does the need for safeguards to ensure that AI systems do not make decisions that could escalate conflicts or violate ethical norms.

The expansion of autonomous technologies also raises concerns about the scale of destruction that AI-enabled warfare could bring. Autonomous systems, by their nature, can be deployed on a much larger scale than human soldiers, potentially leading to massive destruction in a conflict. For example, drones equipped with AI algorithms could carry out targeted strikes across wide geographic areas, vastly increasing the scale and scope of combat operations. While this has the potential to improve military effectiveness by neutralizing threats more efficiently, it also raises the possibility of unintended consequences, such as widespread civilian casualties or the destruction of critical infrastructure. The question of whether the benefits of increased operational efficiency outweigh the risks of large-scale destruction is one of the most pressing ethical concerns surrounding AI in warfare. As the scale

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of destruction expands, so too does the potential for conflicts to spiral out of control, with AI-driven systems potentially making decisions that escalate violence without human intervention or oversight.

Given these challenges, the lack of strong regulatory frameworks around the use of AI in military operations is increasingly problematic. As AI technologies continue to evolve, the need for comprehensive international regulations becomes more urgent. These regulations must address not only the technical aspects of AI systems but also the ethical and legal implications of their use in warfare. It is essential for global discussions to take place, involving policymakers, military leaders, ethicists, and technologists, in order to establish clear rules and guidelines governing the use of AI in combat. This would help ensure that AI technologies are used responsibly, with proper oversight and accountability, and that their deployment does not undermine international humanitarian law or the ethical principles of warfare. Furthermore, these regulatory frameworks must be flexible enough to accommodate the rapid pace of technological innovation while ensuring that military operations remain grounded in ethical and legal standards. The creation of such frameworks is essential to preventing the misuse of AI in warfare and ensuring that technological advancements do not lead to an uncontrollable escalation of conflict.

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