

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON SPECIFIC DEFENCE RESOURCES MANAGEMENT PROCESSES

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Artificial intelligence (AI) has fundamentally transformed the management of defence resources by revolutionizing information collection, risk analysis, and scenario planning, while simultaneously maximizing the efficiency of human, material, informational, financial, infrastructure, and research-development and innovation resources. Through advanced algorithms, machine learning, and big data analytics, military organizations now benefit from enhanced real-time decision-making, predictive analysis, and adaptive strategic management. This article synthesizes the latest academic debates and empirical research on military AI, highlighting both its transformative potential and the ethical, operational, and security risks it introduces.

Keywords: artificial intelligence; augmented decision-making; cyber security; defence resources; managerial processes;

INTRODUCTION

The new paradigms of defence resource management reflect the necessity of continuous adaptation to technological shifts and the complexity of contemporary threats. As Sarjito (2024) aptly points out, *“AI has become the essential engine of innovation within military structures, enabling a dynamic and coordinated response to emerging risks”*. This perspective is echoed by Mayer (2023, p. 521), who notes that *“AI technologies are shaping new procedures for planning and executing of military operations, involving a profound transformation at tactical and strategic levels”*. The integration of AI requires data convergence, resource interconnectivity, and rapid alignment with global dynamics, amplifying the importance of the managerial process as a vector as strategic performance (Rashid et al., 2023; EPRS, 2025).

THEORETICAL FOUNDATIONS OF AI IN THE DEFENCE

In the context of defence, artificial intelligence (AI) is approached as a multidisciplinary set of theories, algorithmic models, and machine learning paradigms that integrate computer science, elements of advanced statistics, cognitive psychology, and, naturally, engineering disciplines. The classic definition of AI, according to Nilsson (2009), encompasses *“any system capable of functioning intelligently and with foresight in a dynamic environment”*, an aspect also highlighted by Mayer (2023), who differentiates between traditional automated systems and the new generation of autonomous systems *“capable of adaptation, independent decision-making, and recalibration in operational contexts”*.

An essential conceptual pillar lies in the way the two fundamental paradigms of AI development are approached:

- the symbolic (top-down) approach, focused on expert systems and logical rules, suitable for tasks with well-defined rules (Mayer, 2023, p. 522);
- the connectionist (bottom-up) approach, focused on artificial neural networks capable of extracting patterns from massive datasets (Russell, Norvig, 2016).

In recent years, Machine Learning (ML) algorithms – Deep Learning (DL) – have enabled automated object recognition, intelligence document analysis, scenario modelling, anomaly detection, autonomous decision-making, and even strategic risks forecasting (Rashid et al., 2023; Mayer, 2023; Sarjito, 2024). Within the vast

and complex field of defence, these techniques are refined and implemented into audio and video recognition systems (ISR, SIGINT), autonomous platforms (drones, ground vehicles), and decision intelligence software for dynamic analysis of multi-source data, such as *Project Maven*, the *Global Information Dominance Experiment* (GIDE), and many others.

Another fundamental concept, well established in the military field, is the *DIKW* (Data-Information-Knowledge-Wisdom) hierarchy, which illustrates how AI transforms raw data collected from a wide range of sources (sensors, cyber networks, etc.) through pattern recognition and semantic integration into decision-making information and operational knowledge (Russell, Norvig, 2016; Mayer, 2023; Sarjito, 2024). In parallel with this concept, *Signal Detection Theory* explains the important role of AI in rapidly discriminating between relevant signals and informational noise in a complex security environment, supporting agile reactions and strategic foresight (Wickens et al., 2004).

Most often, AI applications are classified according to seven basic models (Rashid et al., ib.):

- autonomous systems.
- goal-driven systems.
- pattern and anomaly recognition.
- predictive analytics.
- assisted decision-making.
- human-machine conversation and interaction.
- hyper personalization/contextual adaptation.

These patterns are present in technologies such as facial recognition, autonomous vehicles, predictive maintenance, AI-assisted logistics management, virtual/ intelligent reality-based training and simulation, self-optimizing sensor networks, and rapid decision-making tools (Mayer, ib.; EPRS, 2025).

Systems Theory (Bertalanffy, 1968), the *Technology Acceptance Model* (TAM) developed by Davis in 1989, and *Complex Adaptive Systems* models govern the adoption and integration of AI into military structures, emphasizing cyber resilience, interconnectivity and the development of fully automated or hybrid OODA (Observe, Orient, Decide, Act) loops that are fully automated, or only hybrid (Mayer, ib.; Sarjito, ib.).

Theoretical and methodological innovation continues in the AI domain, showing trends toward the integration of symbolic and connectionist paradigms (hybrid AI), developing autonomous platforms with meta-learning capabilities, and adapting to the expansion of electronic warfare and modern hybrid operations (Rashid et al.; Mayer, ib.; EPRS, 2025).

TRANSFORMING DEFENCE RESOURCE MANAGEMENT PROCESSES THROUGH AI

Before detailing the impact of AI on each specific defence resource, it is important to recall that the managerial process in the defence domain represents “the set of activities of planning, organizing, coordinating, training, commanding, and controlling-evaluating the efficient use of resources in order to achieve the objectives of the military organization” (Webster et al., 1989; Iancu, 2023; EPRS, 2025). All these processes are vital because they ensure the rapid adaptation of the military system to changes in the strategic environment, maximize the value of available resources, and proactively anticipate risks, aspects that become critical in the context of pressures generated by digitalization and the explosion of AI.

Human Resources

The integration of AI into the management of human resources in the defense sector has generated significant transformations in the efficiency, objectivity, and adaptability of managerial processes. Machine learning algorithms and certain specialized platforms enable the automation of recruitment, selection, training, and evaluation processes, raising operational performance to high standards (EPRS, 2025).

Staff recruitment and selection processes benefit from systems (such as HireVue or Pymetrics) that analyse video interviews and questionnaire responses, identifying the behavioral and professional skills appropriate for the position, which leads to a reduction in subjectivity and an increase in the accuracy of decisions regarding the recruitment and selection of the best candidates (Rashid et al., ib.).

Another particularly important aspect of human resource management is the continuous evaluation of staff performance and the generation of adaptive feedback, achieved through solutions such as Workday, SAP Success Factor, or IBM Watson Talent. These platforms can aggregate data from daily activities, reports, and simulations, enabling the development of personalized professional development plans (Mayer, ib.). A relevant example in this regard is the implementation of the “Sgt. Star” chatbot by the US Army, which uses natural language processing techniques to answer questions about recruitment, training, and careers, demonstrating increased efficiency in communicating with candidates and military personnel.

At the European level, the French and German defence ministries use advanced analytics platforms to forecast staff turnover, plan rotations, and identify “talent” within the organization early on (EPRS, 2025).

Among the advantages of centralising this data with AI is the constant monitoring of physical and psychological health. AI also facilitates the generation of predictive reports on future personnel needs and the identification of risks related to collective and individual performance, providing military decision-makers with that mix of superior tools for strategic decision-making (Mayer, *ib.*; EPRS, 2025).

However, it is imperative to develop a set of ethical regulations to ensure algorithmic transparency, decision-making accountability, and the prevention of discrimination in the military environment (Mayer).

Material Resources

The management of material resources in the defence sector requires an integrated approach to AI as a determining factor for optimizing logistics, procurement, maintenance, and inventory management processes (STS Romania, 2023; Ilie, 2024). The importance of these processes stems from the need to ensure operational continuity, rapid response to requests from the theatre of operations, and increased resilience of military structures in dynamic and unpredictable contexts (Jianu, 2014; Ilie, 2024).

Military inventory tracking and management systems widely use automatic recognition tools and techniques (RFID, IoT sensors) and ERP-type platforms with AI modules, facilitating real-time monitoring of equipment, ammunition, food, and spare parts. In the US, the Defence Logistics Agency (DLA) uses over 55 AI models to forecast requirements, prevent stock shortages, detect counterfeits, and optimize procurement strategies, reducing costs by 15-20% and increasing the reliability of specific operations (Traxtech, 2025).

Predictive maintenance, based on machine learning algorithms and the analysis of patterns in military equipment and technology operating data, allows for the anticipation of failures and the optimization of the maintenance cycle. Furthermore, the use of AI for predictive maintenance extends the life cycle of equipment and technology, reduces repair costs, and increases the availability of military equipment and technology. An example of this is the Datategy platform, which provides examples of predictive analysis for a wide range of engines that power US Army equipment (Datategy, 2025-a; Soules et al., 2022).

In terms of operational logistics, the use of autonomous AI-piloted drones for logistics transport, reconnaissance, and rapid supply in hard-to-reach or high-risk areas is transforming traditional paradigms (Infosys BPM, 2025; Verbitskaya, 2025). Navigation algorithms, obstacle avoidance, load management, and energy optimization allow for timely adaptation to weather conditions, significantly reduce delivery times, and minimize resource consumption (Soules et al., *ib.*).

The most important AI tools used in material resource management and a brief description of them are presented in the following figure.

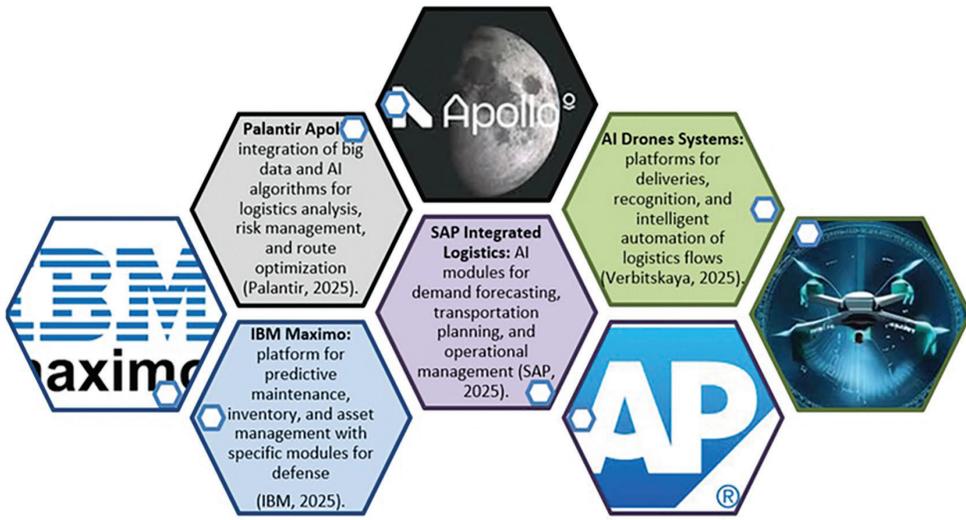


Figure 1: Artificial Intelligence Tools Used in the Management of Material Resources

Through the implementation of these tools, logistics systems become more agile, scalable, and resilient – responding optimally to the demands of the modern military operational environment (Ilie, 2024; STS Romania, 2025; Traxtech, 2025).

Informational Resources

Information resource management in the defence sector has been revolutionized by the application of AI, which provides the mix of information needed by military decision-makers for faster decision-making and advanced protection against cyber threats. Moreover, AI is “the key element in the transformation of data analysis, surveillance, and cyber intelligence processes” (Mayer, p. 524).

Big data, pattern recognition, and anomaly detection algorithms enable the rapid synthesis of large volumes of data, identifying potential threats or informational opportunities in near real time, generating integrated and relevant operational dashboards (Rashid et al., 2023; King, 2024; Sarjito, ib.). Furthermore, AI supports early identification and management of information crises, providing rapid decision support (Johnson, 2019), which is also reflected in Mayer’s (2023, p. 526) words regarding the purpose of AI implementation, namely that “AI fundamentally changes the structure of managerial decision-making, reducing uncertainty and increasing the ability to respond to cyber-attacks and disinformation campaigns”.

Within NATO, the *Information Environment Assessment* (IEA) uses AI to monitor the global information environment, assessing influence activities, social behaviours, and narrative dissemination patterns, with support for operational and strategic decisions (NATO ACT, 2025). AI-assisted analyses such as Narrative Analysis, Sentiment Analysis, and Social Network Analysis are already widely implemented to identify fake news, disinformation operations, and understand relevant social developments in real time (Maathuis, Cools, 2025).

On the cybersecurity side, platforms such as *Darktrace* and *Microsoft Defender AI* monitor network behaviour, detect anomalies, and react almost instantly to cyberattacks, raising the level of protection and reducing incident response time (Fortinet, 2024; Bonnemaïson, 2025). At the same time, AI algorithms are used for robust assessment of vulnerabilities in military networks, identification of risks such as data poisoning, evasion attacks, or pattern theft. An example of this is the *Securing Artificial Intelligence for Battlefield Effective Robustness* (SABER) project developed by DARPA (2025).

The implementation of these key applications and AI tools in the field of information resource management brings benefits on the one hand, but on the other hand, they come with or generate certain challenges that the military organization must give due importance to. By automating data filtering, aggregation, and synthesis, AI significantly reduces response time, increases the accuracy of analyses, and ensures information superiority, especially in the spectrum of hybrid and cyber conflicts (FlySight, 2023; McKinsey, 2025). However, there are increased risks of attacks on sensitive AI systems, susceptibility to data falsification, or the propagation of algorithmic errors without human supervision (King, 2024; DARPA, 2025).

Financial Resources

AI is bringing about significant changes and transformations in financial resource management, optimizing budgeting, fraud detection, and strategic financial planning processes (EY, 2025), facilitating automatic analysis of budget execution, and quickly detecting fraud or anomalies through transaction analysis (AOSR, 2023; EPRS, 2025). Predictive models help simulate financial scenarios and allocate funds based on anticipated risks (ECA, 2019). According to Sarjito (2024, p. 28), “*management processes are thus optimized by reducing expenses and increasing the traceability of financial execution*”, with defence sector institutions thus making the transition from reactive models to proactive processes, increasing the efficiency and transparency of financial execution (Zentner, 2025).

Advanced platforms such as *IBM Cognos* and *SAP S/4HANA for Defense* are used for automated budget analysis, financial risk management, and transaction auditing, substantially reducing administrative costs and processing time (EY, 2025; Singh, 2025).

In terms of financial fraud prevention, AI has become indispensable through systems such as *Tookitaki*, *Fortinet*, and *TMForum*, which identify abnormal behaviour patterns in real time and block suspicious transactions (Fortinet, 2024; Tookitaki, 2025). Such networks use neural networks and anomaly detection to combat phishing, embezzlement, and corruption (TMForum, 2023).

In the strategic budget planning segment, the *ThroughPut* and *Artiv AI* platforms enable financial scenario simulation and allocation optimization, accelerating the decision-making process and reducing human error (DefenseOne, 2024; ThroughPut, 2025). Recent analyses highlight a sharp increase in the share of spending on AI and autonomous systems in global military budgets (Markets and Markets, 2025).

Defence Infrastructure

The Russian-Ukrainian conflict has once again highlighted the importance of defence infrastructure. In military terms, defense infrastructure is defined as “*the permanent buildings and facilities necessary to support, deploy, and operate a nation’s armed forces*” (RAND, 2025). The specialized literature in our country uses the concept of territorial infrastructure, which represents “*all the works, objectives, and facilities that, built in peacetime, can be used for defence purposes in crisis situations or at war, in order to amplify the advantages and properties offered by the national geographical factor, in order to maintain the viability and reliability of the national defense system and the entire economic and military potential.*” (Cernăianu, 2006). As can be easily seen, the Romanian interpretation is much more integrative and emphasizes the moment of capitalizing on this type of resource.

AI has a significant impact on the protection and optimization of defence infrastructure, acting on and, at the same time, transforming each component of this resource, with an emphasis on both the logistical and the cybernetic and operational components.

By integrating AI into critical infrastructures, the armed forces gain the ability to quickly detect threats, automate monitoring and maintenance processes, increase operational resilience, and ensure both physical and digital security (Datategy, 2025b; EPRS, 2025).

Advanced AI solutions are implemented for continuous surveillance of military installations, fusion of data from multiple sensors (radar, IR, EO, sonar), early

identification of anomalies, and effective risk management. Platforms such as Scylla AI demonstrate over 96% accuracy in threat detection, and AI-Driven Sensor Fusion combines and interprets data from multiple diverse sensors – such as cameras, LiDAR, radar, and inertial sensors – to produce a more accurate, comprehensive, and intelligent understanding of an environment or system than any individual sensor could achieve. This technology enables smarter decision-making and provides deeper insights, leading to advances in areas such as autonomous vehicles, predictive maintenance in industrial environments, and enhanced situational awareness in defence applications (Aquah, 2025; Shaw, 2024).

For defence infrastructure resilience, AI is used both at the risk management level –simulating attack, sabotage, or failure scenarios – and at the operational management level (Datategy, 2025). Recent studies emphasize that the integration of AI into defence infrastructure is essential for maintaining the operational superiority and responsiveness of military systems in contested and/or complex environments (Shaw, 2024; PwC, 2025).

Research, Development, and Innovation (RDI) Resources

The integration of RDI resources is a fundamental pillar of military modernization, ensuring rapid adaptation to disruptive technologies such as AI, robotics, drones, autonomous systems, and digitization. The substantial investments made in recent years by the Ministry of National Defence in this area aim, in the medium and short term, to develop in-house capabilities for designing, testing, and implementing state-of-the-art technologies, while stimulating collaboration with international partners and innovative companies (Construct Intelligence, 2025; Mihălțianu, 2025).

Projects such as the national drone program, Romanian *MALE UAV* platforms, and partnerships with global technology leaders (Baykar, Elbit Systems, Thales, Shield AI) demonstrate that RDI resources are directed both towards the development of national know-how and the transfer of advanced technology. Companies such as OVES Enterprise and Carfil Braşov are investing heavily in research and development and manufacturing drones for complex missions, while partnerships with international entities allow for the rapid integration of detection, anti-drone, and smart ammunition systems with AI capabilities (Smid, Mărgăritescu, 2025).

The stimulation of RDI and digitization is reflected in the adoption of solutions for the SMART management of all defence resources, the use of virtual or augmented reality in training, and the creation and implementation of innovation ecosystems and centres of technological excellence at the national or regional level.

PERSPECTIVES OF AI IN DEFENCE RESOURCE MANAGEMENT

The evolution of AI opens new horizons in terms of defence resource management, at the strategic, operational, and tactical levels. In the coming years, AI will have a decisive influence on all components of the military spectrum, from decision-making processes to critical infrastructure security and the development of a digitalised defence doctrine (MSS Defence, 2025; Parangat, 2025).

AI capabilities based on Big Data and predictive models will continue to transform the military decision-making chain, enabling rapid scenario simulation, anticipation of emerging risks, and generation of adaptive interventions in theatres of operations. Systems such as Decision Support System (DSS) or Digital Twins for strategic simulation will provide military decision-makers with real-time data, reducing human error and accelerating adaptation to new types of conflict (Dragomir, 2025; Futures Platform, 2025). At the same time, AI will be increasingly used to merge and integrate data obtained from OSINT, SOGINT, and HUMINT sources, maximizing the information advantage (NATO ACT, 2025).

A major trend is the proliferation of autonomous systems (drones, ground vehicles, and integrated sensors, etc.) capable of executing complex missions without direct human interaction (MSS Defence, 2025; Parangat, 2025). Swarm Intelligence, in particular, will enable simultaneous operations with distributed forces and resources, increasing resilience, adaptability to mission and operating space specifics, and significantly reducing personnel exposure in hostile environments. Connecting these systems to edge computing networks and satellites will provide real-time defense on all fronts: land, air, sea, space, and cyber (SmartDev, 2025).

Sustainability is becoming a priority, with AI being the tool that will reduce resource consumption, optimize logistics and infrastructure maintenance, ensuring both budgetary efficiency and a low environmental footprint. (Parangat, 2025; SmartDev, 2025). Through SMART management of energy and material consumption in military installations, AI systems will directly contribute to the transition to green defense, in line with EU and NATO strategies (MEAT, 2024).

The development of public-private partnerships and national RDI ecosystems will enable not only the rapid adoption of technological advances but also digital sovereignty and strengthened international cooperation (ADR, 2024). Defense-as-a-Service (DaaS) models, including satellite services or ISR platforms, will make management processes more flexible, scalable, and financially predictable (MSS Defense, 2025).

The most challenging perspective remains that related of AI governance and regulation at all levels and in all areas of society. The need for transparency, algorithmic accountability, and ethical control is more acute now that decision-making is increasingly delegated to machines. Specialists from various fields are now proposing the development of an internationally applicable legal framework to sanction abuses and manage the moral dilemmas of AI and autonomous lethal force (Universul Juridic, 2025; European Parliament, 2025).

AI will not automatically resolve tensions in the security environment, but it will certainly be the key to future military superiority, allowing states that integrate it effectively to react adaptively, protect themselves intelligently, and anticipate new paradigms of hybrid warfare.

CONCLUSIONS

The article demonstrates that artificial intelligence has established itself as a strategic transformative vector in defence resource management, driving the efficiency, adaptability, and resilience of modern military systems. The integration of AI into defence resource management processes balances the need for rapid decision-making with the increasingly stringent requirement for security. Through automation, big data analysis, simulation, and autonomy, military structures have gained the ability to react proactively and adaptively, to manage complex scenarios, and to continuously innovate under the pressure of global competition and emerging crises.

The benefits offered by AI – cost reduction, increased response speed, transition to predictive and proactive operational models – are already being realized in military practice, both nationally and internationally. The automation of logistics processes with AI, rapid detection of vulnerabilities, optimization of all types of resources, and algorithm-assisted decision-making are becoming not only opportunities but also standard operational requirements.

At the same time, the expansion of AI also brings several significant challenges: cybersecurity risks, dependence on complex infrastructures, an acute need for ethics and algorithmic governance, and the risk of autonomous decision-making errors with strategic impact. The depersonalization of decision-making and the delegation of critical tasks to AI agents make it imperative to maintain ultimate human control and implement a robust legal framework to prevent abuses and incidents with lethal or serious geopolitical potential.

The future belongs to those military and civilian organizations that demonstrate flexibility, innovation, and the ability to ensure human-machine interoperability

in a transparent, responsible, and legally validated manner. Continued investment in R&D, international collaboration, and the development of human skills to understand and manage AI will be key to maintaining information superiority and strategic and technological resilience in the context of the accelerated evolution of digital warfare.

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