

Legal Challenges to the Use of Smart Weapons

التحديات القانونية لاستخدام الأسلحة الذكية

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الملخص:

إن تطور تكنولوجيا الذكاء الاصطناعي تسبب في تطور أساليب ووسائل القتال ونتج عنه ظهور الأسلحة الذكية التي تعرف بقدرتها على تحديد الأهداف وكيفية التعامل معها دون الحاجة لتدخل وتحكم بشري مباشر، حيث تستند هذه الأسلحة على بيانات خوارزمية جد متقدمة وهي مزودة بآليات معرفية تجعلها قادرة حتى على التأقلم مع المتغيرات المحيطة بها والاستجابة السريعة لها. إن التطور المذهل لهذه الأسلحة، يطرح الكثير من الإشكالات القانونية خاصة وفي ظل الإشتباه في استخدامها خلال النزاعات المعاصرة وإمكانية تسببها في ارتكاب جرائم وانتهاكات جسيمة لحقوق الإنسان، يصعب تحديد المسؤولين عنها وتحقيق المحاسبة عليها، لغياب أطر قانونية واضحة تخص استخدام هذا النوع من الأسلحة لحد الساعة. تهدف هذه الدراسة إلى تسليط الضوء على أهم التحديات القانونية لاستخدام الأسلحة الذكية قصد التأكيد على ضرورة وضع الأطر القانونية الكفيلة بتنظيم استخدامها لاسيما وفي ظل التسارع التكنولوجي المذهل في المجال العسكري.

الكلمات المفتاحية: الأسلحة الذكية، الأسلحة الذاتية التشغيل، التحديات القانونية، القانون الدولي الإنساني.

Abstract:

The advancement of artificial intelligence (AI) technology has paralleled developments in combat methods and means. Smart weapons have emerged, capable of identifying and engaging targets without human intervention. These weapons rely on algorithmic data and are equipped with motors or sensors that assist in target identification and engagement decisions. Despite their sophistication, such weapons may lead to numerous crimes and human rights violations, and determining accountability for these actions remains challenging. To date, no specific laws have been enacted to regulate the use of this type of weapon. This study aims to identify the legal challenges associated with the use of smart weapons, particularly in the context of rapid technological advancements in the military field.

KEY WORDS: Smart Weapons, Autonomous Weapons, Legal Challenges, International Humanitarian Law.

Introduction:

The power of nations in the past was closely linked to traditional military methods, relying entirely on the density of the human element, its physical readiness, and the possession of heavy weapons such as artillery, tanks, and armored vehicles. Perhaps the best example of this is what happened during the First and Second World Wars, and Germany's military superiority at that time. What created Germany's military power was, first, its human density, second, its massive military arsenal, third, its advanced and continuous military manufacturing, and fourth, its available resources. Yet, the French army, the largest army in Europe at the time and superior to the German Wehrmacht by twelve divisions at the beginning of World War II, suffered defeat for several reasons.

However, this concept began to gradually change, especially after the Cold War. New tools began to emerge that enhanced military power, such as the use of electromagnetic fields, which have the ability to control enemy systems; electronic warfare, which can disrupt encrypted communications systems and provide images of facilities and camps; and drones, which can destroy strategic targets with high precision. This led to a shift in the concept of warfare in the modern era, leading to the emergence of a new concept that no longer relies on soldiers and battlefields, but rather focuses on destroying infrastructure and vital facilities. These tools are no less necessary and effective than conventional warfare, as they cause chaos and instability for people, who constitute a pressure card on their governments.

Future warfare will be different as a result of the military's reliance on AI technology, which has sparked the creation of new generations of AI-based weaponry and weapons systems. Without incurring significant financial or human costs, their anticipated impact could surpass that of conventional combat. They are mostly manufactured and operated by robots and lasers, which has caused a worldwide armaments war between major states. When the four 1949 Geneva Conventions and the international treaties defining the types and uses of weapons and restricting their dissemination were concluded, nations did not, however, take this development into consideration. They weren't intended to be used with a system that has these intelligent technologies. This has led to the emergence of legal challenges to the use of smart weaponry.

Study Problem:

The Fourth Industrial Revolution of the twenty-first century has contributed to rapid technological developments, represented by the advancement of digital technology, artificial intelligence, and neural networks. These developments have impacted the political, economic, social, security, and military spheres. This technology has contributed to the emergence of smart weapons. However, there are currently no legal rules adopting a specific position on smart weapons in contemporary wars and armed conflicts, despite the fact that these weapons are now used in most international and non-international armed conflicts, and their use is becoming increasingly widespread. Therefore, this study seeks to answer the following question: **What are the most important legal challenges that stand in the way of the use of smart weapons?**

Study Objectives: Our current study seeks to achieve the following objectives:

- Identify the concept of smart weapons, their most important characteristics, and types.
- Identify the position of international legal jurisprudence on the use of smart weapons.
- Shed light on the extent to which smart weapons comply with the principles of international humanitarian law.

Study Methodology:

The study relies on the analytical approach to analyze international legal texts and jurisprudential opinions on smart weapons, their characteristics, and types. It also explores the position of international legal jurisprudence on their use, and sheds light on the extent to which smart weapons comply with the principles of international humanitarian law.

1-The Concept of Smart Weapons:

1.1- Definition of Artificial Intelligence:

The ongoing advancements and developments in the field are continuously updating the concept of artificial intelligence, which is a dynamic and recurrent battle. The area of artificial intelligence, which has been around for more than 60 years, is bigger, more sophisticated, and richer than most other sectors of science and technology, even if the phrase is currently widely used as a relatively general notion that includes a wide range of diverse technologies¹.

No field will be immune to the rapid advancement of artificial intelligence and artificial beings, which will continue to reflect on the uncertain future of robots, because the future in the human imagination evokes a mixture of fear and sadness toward the unknown, despite the urgent need for more knowledge about the values, beliefs, and theories that have emerged around the history of human thought and the human condition².

The Fourth Industrial Revolution, which the world is currently experiencing, was preceded by three distinct periods, which are as follows:

- The Industrial Revolution, which was marked by newly discovered forms of energy like electricity, oil, and steel, served as the basis for the development of the telephone.
- The first, which took place in the twelfth century and lasted until the nineteenth century, saw the shift from an agricultural society to an industrial society propelled by steam and water.
- The third is the Internet, which allows users to access knowledge from around the globe without ever leaving their offices³.

Although the concept of artificial intelligence (AI) as a technical term date back to the 1950s⁴, with the first appearance of the term "artificial intelligence" in 1955 at a conference held at Dartmouth College⁵, it is difficult to define AI for two reasons: There is little agreement on what AI is, and there is little reason to believe that AI has much to do with human intelligence. Although there are many proposed definitions of AI, each with its own bias, most of them roughly converge around the concept of creating programs or computers capable of behavior that can be considered intelligent⁶.

We conclude that it is difficult to define the concept of artificial intelligence, as the field itself is vast and has offered many different definitions, including:

- It is “a computational tool created through human intervention that thinks or behaves like humans or how humans are expected to think or behave”⁷.
- It is “the field of science and technological innovation aimed at creating machines, artificial agents, and more complex systems that mimic cognitive functions such as evaluating, learning, and problem-solving, which humans may associate with their own means”⁸.
- The Oxford Dictionary defines it as “the theory and development of computer systems capable of performing tasks that normally require human intelligence”⁹.
- It is “the activity of making machines intelligent; intelligence means the quality that enables an entity to act appropriately and wisely by considering the consequences of its environment”¹⁰.
- It is “the development of computer programs dedicated to performing tasks that have so far been satisfactorily performed by humans, as these require high-level mental processes such as cognitive learning, memory organization, and critical thinking. It aims to improve the cognitive and mental processes in machines so that they are capable of thinking, perceiving, and making decisions”¹¹.
- It is “a general-purpose technology aimed at automating and improving the accuracy, speed, and/or scope of machine decision-making, and recognizing and predicting patterns in complex or large environments, with the goal of replacing humans with automation or improving human performance in specific tasks”¹².

So, Artificial intelligence is defined as the simulation of human logical reasoning to identify and solve problems, analyze environments and risks, and make predictions. These cognitive abilities offer valuable opportunities to improve decision-making, especially in public policy and societal development aimed at achieving shared goals.

1.2- Definition of smart weapons:

Smart weapons are defined as “a weapon system that can independently select and attack targets”¹³, yet there is no universally accepted description of what they are. It is important to note that words like automatic, autonomous, and self-operating are used in all definitions and terminology used for smart weapons. This is the characteristic of independence, meaning that the weapon system is independent of human control over decision-making and action, meaning that it can make decisions independently.

On this basis, using the phrase “lethal force,” the UN Special Rapporteur on extrajudicial, summary, or arbitrary executions, described autonomous robots as weapon systems that, once triggered, may choose and engage certain targets without further human assistance¹⁴.

According to the 2012 US Department of Defense Instruction on Autonomy in Weapons Systems, intelligent weapon systems are “weapon systems that, once activated, can select and engage targets without additional intervention from a human operator. This includes human-supervised weapon systems designed to allow a human operator to override a weapon system operation but that can select and engage targets without human intervention after activation”¹⁵.

The International Committee of the Red Cross (ICRC) uses “automated weapons systems” as a catch-all term for all types of smart weapons systems, whether on land, in the air, or at sea, that operate autonomously in their critical functions. This implies a weapon that can choose and strike targets on its own without assistance from a human. Following initial activation, the weapon system targets and executes operations that are typically managed by people utilizing sensors, programming, and weaponry¹⁶.

Human Rights Watch's definition of these weapons, which is the definition adopted by the US Department of Defense, defines them as “automated weapon systems that, when activated, can select and engage targets without the need for additional intervention from the human operator”¹⁷.

2-Characteristics and types of smart weapons according to the degree of human control over them:

2.1-Smart weapons characteristics

Smart weapons have a set of characteristics, including the following:

2.1.1- Autonomy:

Without human supervision or control, smart weapons function on their own. Depending on the programming they utilize to perform their fighting functions, they can choose targets and engage them. This technique, known as automation, allows a machine to carry out particular activities using software commands. It also has automatic feedback control to guarantee that operations are carried out correctly, allowing the system to function without the need for human interaction¹⁸.

2.1.2- Learning, Adaptation, and Adaptation:

The ability to alter one's direction by observing one's surroundings is known as adaptation. Autonomous weapons are equipped with sophisticated artificial intelligence-based software technologies that allow them to learn and gain knowledge from direct testing and simulation systems. This, in turn, enables them to adapt to various new situations and correct errors without referring to a human source. This means they perform this function automatically, even when out of contact with the base¹⁹.

Technical studies indicate that any system that continues to learn after being operated and activated will constantly change, and after a very short period of time, this system will no longer be the system that was activated by the human operator. Perhaps this is the most important challenge facing smart weapons systems and casts doubt on their legitimacy, especially in light of the obligation contained in Article 36 of Protocol I to the Geneva Conventions relating to new weapons, which stipulates that Any High Contracting Party shall be obliged, when studying, developing or acquiring a new weapon, means of warfare or method of warfare, to ascertain whether such use is prohibited in all or some of the circumstances by this Annex (Protocol) or by any other rule of international law to which the High Contracting Party is bound. This is because states can start testing, evaluating and verifying that these weapons meet the obligations stipulated in the text of this article, but because they are weapons with adaptive technological systems, meaning that they adapt to the surrounding environment and thus change very quickly, unlike weapons with other automated systems, for which adaptation is not a feature. Rather, they are systems that behave mechanically regardless of the surrounding environment and only when receiving certain

inputs, and perhaps at a certain time, and will operate in one specific way according to what the human operator of these systems wants. The human operator may make control of these systems manual, semi-automatic or fully automatic²⁰.

2.1.3- Complexity:

It is challenging to comprehend the process by which smart weapons explain their outputs and actions because to their incredibly sophisticated technical nature. If these outputs rely on deep levels of neural networks, it is equally challenging to analyze them, and faults cannot be traced. As a result, researchers believe that explainable artificial intelligence could be developed. This creates a conceptual conflict, especially when it comes to identifying and documenting mistakes in a way that holds people accountable for any infractions that might take place. The developer, programmer, designer, military commander, or other contemporary notions associated with accountability and responsibility bear this burden, or the system is left akin to a black box²¹.

2.1.4- Lethality:

The conduct of intelligent weapons that lacks human emotions is referred to as lethality. It alludes to the reality that they conduct their missions with no regard for humanitarian concerns and do not flee in dire humanitarian circumstances²². Second only to autonomy, lethality is one of the most crucial aspects of smart weaponry. These weapons are more deadly and destructive the more autonomous they are, particularly if they are intended to target humans. Experts in international law are concerned about this issue²³. The lethality characteristic is also linked to another characteristic, namely unpredictability that is the difficulty of predicting what smart weapons might do in various circumstances. This, in turn, is what raises concerns among the international community, as this characteristic leads to weakness or a lack of reliability in the actions that these weapons might perform²⁴.

2.2-Types of smart weapons according to the degree of human control over them:

It is well known that many countries are actively developing military systems that use advanced technologies to assist human soldiers in combat roles and, to some extent, complement them. These include smart systems, which are usually described as autonomous. However, the degree of autonomy varies depending on the interaction between humans and machines. Smart weapons fall into three categories:

2.2.1- A fully human-controlled weapon:

In fully human-controlled systems, a human operator issues a series of commands to a machine to perform specific actions, such as firing a weapon²⁵. If the autonomous machine encounters a scenario requiring a decision beyond its programmed parameters, it automatically stops and awaits further human input before proceeding. The human operator retains the critical functions of targeting and attack. These systems can be described as defensive systems only, and can be deployed in simple environments as fixed systems. They can then be activated to hit objects instead of humans²⁶. The most prominent example often cited as an automatic weapon system, where humans remain in control of the smart weapon, is the unmanned Predator drone, which is remotely controlled by a pilot on the ground and is therefore subject to human control on the other side of autonomy²⁷.

2.2.2- Partially human-controlled weapon:

The ability of an autonomous weapon to select targets, act, and use force under the control of a human who can override, stop, and control actions at any stage. These targets must be individual or target groups pre-specified by the human operator²⁸. This means that the human operator retains the ability to intervene and terminate obligations, such as in the event of a system failure. He can intervene at this stage before unacceptable levels of damage occur, giving the human operator the right to intercept, monitor, and address the system's actions in a timely manner. An example of this is the Zionist entity's Iron Dome system, which executes pre-programmed missions without further human involvement after activation, unless human intervention is required when necessary²⁹.

2.2.3-Weapons that do not involve human intervention:

These are autonomous weapons systems that are capable of identifying and attacking targets without human intervention. They are able to assess their condition and make their own targeting decisions. Examples of this include the American Patriot and Phalanx anti-missile systems, which are used to counter Israeli missile systems³⁰. Further technological progress will make it more difficult for humans to effectively interfere with automated systems and participate in warfare in any way other than providing general strategic direction. It is even possible to imagine that intelligent machines will one day identify the "real enemy", because attacks may occur too quickly for humans to respond. Some new methods may conceal the originator of warfare, as in strategic information warfare (information hacking), because it will take a long time for countries that have been subjected to such attacks to determine who originated them and how to respond appropriately³¹.

3-The position of international law jurisprudence on the use of smart weapons:

Autonomous smart weapons have sparked widespread controversy in international law due to their ability to respond to changing conditions in the environment in which they are used. They are able to identify targets through sensors that help them perceive the surrounding conditions. However, it is hoped that they will also be able to identify civilians and avoid any harm that may be inflicted upon them by the attack in which they are used. These machines have raised concerns over the creation and application of weapons that can carry out progressively more complex tasks, such as targeting and applying force with little to no human oversight, as follows:

3.1-The trend in favor of the use of smart weapons:

This trend supports the use of smart weapons in conflicts for several reasons, including:

- They are acknowledged for their force-multiplying properties. Military robots are more effective fighters than human soldiers because they use fewer of them. They are able to get to places that are hard or impossible for a fair combatant to get to³². Additionally, by eliminating human warriors from hazardous missions, these weapons lessen the number of human losses³³.
- Some contend that using smart weapons on the battlefield is preferable because fighter pilots are unable to fly due to the physical strain of high-G maneuvers and the extreme mental attention and awareness needed³⁴.

- An unmanned aerial vehicle with automatic maneuverability and precision could destroy an entire fleet of aircraft with a few hundred rounds and enough fuel reserves. Smart weapons can be designed to do random and surprising actions, confusing a foe³⁵.
- Smart weapons are invincible and fearless, they cannot get hungry or tired, they have no survival instinct, and they can sense more information at once and process it faster than humans³⁶. Neuroscience studies have shown that the neural circuits responsible for conscious self-control can stop working when they are burdened with stress³⁷.

3.2-The trend against the use of smart weapons:

Opponents of the use of smart weapons argue that they are not based on moral grounds, are misleading weapons, and lack the elements of discrimination, perception, proportionality, and precaution when launching an attack. Supporters of this viewpoint rely on a number of justifications, including:

- AI has the potential to help humans, but its potential benefits could be offset by a military arms race. Because of this, autonomous offensive weapons that are not under human control must be prohibited³⁸.
- Human Rights Watch has firmly said that autonomous smart weapons would jeopardize civilian non-legal protections and are unable to adhere to legal requirements. Thus, governments ought to immediately work toward outlawing them³⁹.
- In July 2015, a joint international conference on artificial intelligence put a prohibition on autonomous weaponry. According to the conference's conclusion, AI technology has advanced to the point where it will be feasible to implement such systems in a matter of years rather than decades. Given that autonomous weapons have been dubbed the third revolution in warfare, following nuclear weapons and gunpowder, the hazards are substantial⁴⁰.
- The UN Human Rights Council received a report from the UN Special Rapporteur on extrajudicial, summary, or arbitrary executions in April 2013⁴¹. In this report, Special Rapporteur Heyns discussed the consequences of new technologies, focusing on lethal autonomous robotics, as they pertain to the right to life. He accentuated that measures are necessary to prevent these technologies from enabling international military interventions which could result in summary or arbitrary executions⁴².
- It is legally and practically impossible to delegate life-or-death decision-making to smart weapons⁴³. Therefore, a ban on smart weapons is necessary because they violate the principle of distinction, one of the most fundamental rules of armed conflict. Autonomous weapons systems would find it extremely difficult to determine whether a target is a civilian or a combatant, a task even for humans⁴⁴.
- International humanitarian law, or the law of war, requires that someone be held responsible for harm to civilians. This is lacking with smart weapons, as it is impossible to determine responsibility for the injuries they cause. Therefore, they should not be used in war. Therefore, it was proposed to set limits on the development of autonomous weapons technology and draw red lines that future technological developments should not be allowed to cross⁴⁵.

4-The extent to which smart weapons comply with the principles of international humanitarian law:

Applying pre-existing legal rules to a new technology raises the question of whether these rules are sufficiently clear in light of the unique and perhaps unprecedented characteristics of this technology and its impact, and whether they are even applicable at all, or whether new, more appropriate and precise rules are required, given that these weapons pose a challenge to existing rules. The issue of their legal compliance remains a matter of intense debate.

Nevertheless, since these weapons are governed by international humanitarian law, it is undeniable that this law can be applied to them. In addition to the Martens Clause, which is a useful tool when there are no explicit legal regulations governing their application, the majority of these principles—such as distinction, proportionality, military necessity, and taking reasonable precautions—are actually customary principles that must be followed during times of conflict.

4.1-The extent to which smart weapons comply with the principle of discrimination:

The principle of distinction requires that, when an armed conflict erupts, there must be a distinction between legitimate and illegitimate targets when directing lethal or destructive strikes. Not every target may be struck. Legitimate targets are those that aim to weaken the enemy's fighting force, and therefore strikes may be directed against them. Examples of these include attacks against combatants, military targets, or even civilians who are actually and directly participating in hostilities. Other targets that have nothing to do with weakening the enemy's fighting force and do not affect the course of hostilities, such as attacks on civilians, civilian objects, persons not participating in hostilities, or surrendering combatants, are all illegitimate targets⁴⁶.

This principle requires that a distinction be made between combatants and civilians, and between military objectives and civilian objects, using reasonable judgment in the circumstances⁴⁷. Article 48 of Additional Protocol I (1977) to the Geneva Conventions establishes the rule of distinction, requiring parties to target only military objectives and to differentiate between civilians and combatants. This principle, recognized as customary international law, is fundamental to international humanitarian law. According to the ICRC and the International Court of Justice, it applies universally—even to states not party to the Protocol—and prohibits the use of indiscriminate weapons that cannot distinguish between lawful and unlawful targets⁴⁸.

The International Committee of the Red Cross (ICRC) believes that applying the rule of distinction is neither easy nor straightforward, and in this sense, it poses a challenge to programmers of smart weapons systems. In armed conflicts between uniformed armies, these systems must distinguish between a soldier in uniform carrying a weapon and a civilian wearing an official uniform who also carries a weapon, such as a police officer. Furthermore, given the current nature of armed conflicts, in which military operations take place in populated areas, and as civilians increasingly participate in these operations, either within the ranks of the state or with armed groups without wearing official uniforms, the distinction between combatants who may be targeted and civilians who may not be attacked has become more complex⁴⁹.

Based on the above, this principle is considered one of the most complex problems for smart weapons, as they do not have the ability to apply this principle. No matter how accurate the sensors used in these weapons are, they will not be fully secure in terms of their ability to distinguish between combatants and non-combatants⁵⁰, especially in the various environments of contemporary warfare. They are unable to assess individuals' intentions, differentiate between the wounded and the unwounded, or understand an individual's emotional state, which is an essential assessment for identifying targets. They lack the ability to sense and scrutinize⁵¹. Experts have noted that the inability of smart weapons "robots" to interpret intentions and emotions in counterinsurgency operations and unconventional warfare, where combatants can often be distinguished only by interpreting behavior, will constitute a major obstacle to compliance with the rule of discrimination⁵².

The problem is not limited to the technical inadequacy of sensors, but also relates to the translation of the rules of international humanitarian law into computer language⁵³. Smart weapons do not have the ability to understand context, and it is difficult to use the language of international humanitarian law to define non-combatant status from a practical and technical perspective, a language that must certainly be translated into a computer program⁵⁴. This makes it difficult for smart weapons to verify, for example, whether combatants have been injured, whether they have agreed and ceased fighting, or whether they are about to surrender. In other words, they lack the basic components required to ensure compliance with the principle of distinction⁵⁵.

According to Article 52/2 of Additional Protocol I (1977), attacks must be directed only at military objectives—those that contribute effectively to military action and whose destruction offers a clear military advantage. For smart weapons to make this distinction, they would need highly advanced technical capabilities to identify targets and assess their military value under specific circumstances. This complex evaluation is essential to determine the legality of an attack⁵⁶.

4.2- The extent to which smart weapons comply with the principle of proportionality:

The principle of proportionality is a customary principle that must be taken into account before launching strikes or before an attack. It simply means balancing the expected military advantages of the strike with the anticipated damage to civilians or civilian objects, to determine whether a strike is necessary or not, and whether the damage to civilians or civilian objects resulting from the attack is proportional to the anticipated military advantages⁵⁷. This principle provides additional protection to civilians and civilian objects that are not directly targeted by the attack but are vulnerable to the effects of a lawful attack. Article 51/5/b of Additional Protocol I of 1977 to the 1949 Geneva Conventions states that: the following, among others, are considered indiscriminate attacks... an attack which is expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or the result of which would be excessive in relation to the concrete and direct military advantage anticipated.

Due to its direct relationship to individual judgment as well as the context and circumstances of combat operations, this principle is one of the most complicated regulations in international humanitarian law, particularly when it comes to smart weapons. Because smart weapons are already pre-programmed, any uncertainty in their judgment, along with the complexity of the operational parameters and situations, could result in unanticipated and undesirable conduct that could have disastrous repercussions⁵⁸. According to UN Special

Rapporteur Christof Heyns, smart weapons have a significant impact on international peace and security as well as social values, particularly the preservation and value of life. Although it is possible to anticipate that these weapons will comply with international humanitarian law and international human rights law in some situations, particularly when used in conjunction with humans, it is currently unclear to what degree these weapons can meet these requirements in many areas⁵⁹.

Human Rights Watch argues that smart weapons lack the human judgment necessary to apply the principle of proportionality. The organization believes that it is unlikely robots can be pre-programmed to handle the countless scenarios they may face, making real-time interpretation difficult. Experts also suggest that the complexity of analyzing many cases may hinder a robot's ability to follow proportionality⁶⁰.

There are concerns that smart weapons may not be able to meet the requirements of the principle of proportionality, which involves assessing civilian harm versus military advantage. Since battle conditions constantly change, this evaluation depends on the personal judgment of military commanders. In modern warfare, it's nearly impossible to be certain that the military benefit will always outweigh the harm to civilians⁶¹. Some argue that the main challenge smart weapons face in applying the principle of proportionality is not evaluating risks to civilians, but rather determining the expected military advantage of an attack⁶².

Compliance with proportionality requires evaluating alternative actions, predicting civilian harm, adapting to changing conflict conditions, and judging acceptable collateral damage. This complex balance relies on human judgment, which smart weapons, lacking human reasoning, cannot provide.

4.3- The extent to which smart weapons comply with the principle of military necessity:

The foundation of international humanitarian law is striking a balance between humanitarian concerns and military necessity standards. While humanitarian concerns demand that a military advantage be gained with the least amount of equipment and casualties, military necessity demands that force be used to the extent required to attain this advantage. The type and extent of force that can be used in direct attacks on legitimate military objectives must be decided using the principles of military necessity and humanity if there are no clear regulations defining these parameters⁶³.

Balancing military necessity and humanitarian concerns is also implicitly stipulated in various provisions of the Geneva Conventions and their Additional Protocols. For instance, Article 35 of Additional Protocol I prohibits methods of warfare that cause superfluous injury or unnecessary suffering. Additionally, Article 57 outlines precautions in attack, requiring that constant care be taken to spare the civilian population, inherently involving considerations of military necessity to avoid excessive collateral damage.

International jurisprudence and jurisprudence have agreed that military necessity is binding and bound by a number of conditions, namely:

- The occurrence of this condition is linked to the course of military operations during the stages of combat.
- The temporary nature of military necessity, beginning with the beginning of the act and ending with its cessation.

- The measures used to implement it must not be prohibited under international humanitarian law.
- The belligerent forces must not have any choice in determining the nature and type of means used during the occurrence of military necessity⁶⁴.

In the context of smart weapons and their potential to satisfy the principle of military necessity, some claim that the ability of smart weapons to meet the requirements of this principle depends on meeting the needs of another principle, namely the principle of discriminating. If smart weapons cannot identify the target, whether it is military or civilian, they cannot evaluate whether its annihilation is a military need⁶⁵. The force that these weapons can provide must also be kept to the minimum required to accomplish the conflict's justifiable objective in order to adhere to the principle of military necessity. Thus, this principle is broken by permitting smart weapons to employ an infinite amount of force.⁶⁶ Opponents of these systems believe that they will find it difficult to assess military necessity, and it may even be impossible for them to do so, because the principle is linked to the being and thought of the human being. However, supporters of these systems argue the opposite, saying that their use is only for military necessity⁶⁷.

4.4-The extent to which smart weapons comply with the precautionary principle during an attack:

The precautionary principle is a general principle of humanitarian law. It overlaps with the principles of distinction and proportionality, as it constitutes an additional standard that helps in the proper application of the two principles and provides additional protection for civilians and civilian objects. This principle is stipulated in Article 57 of Additional Protocol I to the four Geneva Conventions of 1949, which states that “constant care shall be taken in the conduct of military operations to spare the civilian population, civilians and civilian objects”.

State practice has established this rule as one of the rules of customary international law applicable in international and non-international armed conflicts. The purpose of the precautionary rule is to ensure that protected persons do not lose their protection as a result of error or the irresponsible use of force⁶⁸.

The precautionary principle has become increasingly important due to the changing nature of warfare, where combatants often hide among civilians, making targeting more difficult. This poses serious challenges for military commanders—and even more so for smart weapons, which operate without direct human decision-making in real time. The ICRC highlights that precautions largely rely on human planning and decision-making, not on machines. Although smart weapons can be programmed to consider civilian harm beforehand, their limited ability to adapt to evolving battlefield conditions casts doubt on their reliability in ensuring precautionary measures during attacks, especially with current and near-future technology⁶⁹.

The ICRC highlights differing expert views on verifying target identity with smart weapons. One expert suggests using onboard or external sensors to improve target identification, while another believes that automatic target recognition technology can meet this requirement when targeting identifiable military equipment. Regarding minimizing collateral damage, the ICRC sees two layers of responsibility: the military commander's decision to deploy the smart weapon, and the weapon system's own method of executing the attack⁷⁰.

In terms of canceling or suspending an attack, this procedure poses a challenge when using smart weapons systems in terms of the time period required between putting these weapons into service and identifying and attacking the target, especially in a dynamic and changing environment. There is a high probability that the surrounding conditions will change between the weapon's operation and the attack. Accordingly, the weapon must be designed to allow for verification of targets as required by the principle of precautions during an attack, either through programming or by a "human" operator. For this reason, it is proposed that the feature of disabling the operation of the smart weapons system by humans be integrated into the weapon design, with the risk that humans may not be able to intercept smart weapons systems effectively, due to the large amount of information and the tremendous speed with which these systems process it⁷¹.

Conclusion:

Smart weapons are weapons capable of selecting, identifying, and targeting a target. While this is done by humans in conventional weapons, these tasks remain entirely delegated to the machine itself in smart weapons. These weapons have been given various names, such as autonomous weapons, automatic weapons, lethal unmanned weapons, and killer robots.

International legal jurisprudence has differed on the legality of using smart weapons, and they have been divided into two groups. The first group supported the idea of using this type of weapon because it would protect many soldiers from being killed, in addition to the ability of these weapons to perform many tasks that are difficult for humans to perform. Furthermore, these weapons lack emotions and are therefore not affected by their use. Therefore, this group focused on the advantages of their use. However, the second group believed that the use of these weapons could⁷² lead to massive civilian casualties because these weapons do not differentiate between soldiers and civilians, and the difficulty of controlling these machines in the event of a decision to attack is reversed.

Finally, smart weapons cannot be trusted to perform their work in a manner consistent with the rules of international humanitarian law without the intervention of a human operator, due to their inability to comply with the rules of international humanitarian law in an absolute manner, especially since they are merely machines whose operation is based on programming the logical information of an autonomous system. Therefore, their operation is in accordance with the programming, without any intentional attack upon targeting.

Citations:

- 1-Tencent Research Inst., Artificial Intelligence: A National Strategic Initiative, Springer Nature 2020, P. 2.
- 2-Patrick Lin, Keith Abney & Ryan Jenkins, Robot Ethics 2.0: From Autonomous Cars to Artificial Intelligence, Oxford University Press 2017, P. 271.
- 3-Rosario Girasa, Artificial Intelligence as a Disruptive Technology: Economic Transformation and Government Regulation, Springer Nature 2020, P. 4.
- 4-Tencent Research, Op, Cit, P. 6.
- 5-Girasa, Op, Cit, P. 6.
- 6-Jerry Kaplan, Artificial Intelligence: What Everyone Needs to Know, Oxford University Press, 2016, P. 1.
- 7-Virginia Dignum, Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way, Springer Nature, 2019, P. 9.
- 8-Ugo Pagallo& Woodrow Barfield, Research Handbook on The Law of Artificial Intelligence, Edward Elgar Publishing, 2018, P. 385.
- 9-OECD, The Digitalization of Science, Technology and Innovation: Key Developments and Policies, OECD Publishing 2020, P. 120.
- 10-Nils J. Nilsson, The Quest for Artificial Intelligence: A History of Ideas and Achievements, Cambridge University Press, 2010, P. 13.
- 11-Marvin Minsky, Steps Toward Artificial Intelligence, Proceedings of the IRE, 1961, P. 8.
- 12-Matthijs Maas, International Law Does Not Compute: Artificial Intelligence and The Development, Displacement or Destruction of The Global Legal Order, Melbourne journal of international law, vol 20,2019, PP. 2-4.
- 13-International Committee of the Red Cross, Report on International Humanitarian Law and the Challenges of Contemporary Armed Conflicts “The Power of Humanity”, 32nd International Conference of the Red Cross and Red Crescent, Geneva, Switzerland, 2015, p. 62.
- 14-Christof Heyns, Autonomous Weapons System and Human Right law, Presentation Made atthe Informal Expert Meeting Organized by the State Parties to the convention on certain conventional weapons, Geneva, 2014, P. 1.
- 15-United States of America, Department of Defense, Directive NO. 3000. 09, 21 November 2012, subject: autonomy in weapon systems,PP. 13-14, available at:<https://fr.scribd.com/document/270265368/Autonomy-in-Weapon-Systems>
- 16-International Committee of the Red Cross, Report on International Humanitarian Law and the Challenges of Contemporary Armed Conflicts “The Power of Humanity”, Op, Cit, P. 62.
- 17-United Nations, Report of the Special Rapporteur on extrajudicial, summary or arbitrary executions, Op, Cit, P. 10.
- 18-Duaa Jalil Hatem, Autonomous Weapons and International Responsibility, Master's Thesis, University of Baghdad, Iraq, 2020, P. 17.
- 19-Ishaq Al-Ashaash, Lethal Autonomous Weapon Systems in International Law: A Legal Approach to the Problem of Their International Confinement, Jil Journal of Human Rights, Tripoli, Lebanon, Vol. 29, Issue 30, May 2018, P. 159.

-
- 20-Maziar Homayounnejad, Lethal Autonomous Weapon Systems under the law of armed conflict, Doctor of Philosophy, King's College London, 2018, PP. 40-41.
- 21-Abdul Qader Mahmoud Muhammad Al-Aqraa, Military Robots in Future Wars and the Extent of Their Subjection to the Provisions of International Humanitarian Law, Legal Journal, Vol. 8, No. 3, 2020, P. 160.
- 22- Al-Ashaash, Op, Cit, P. 180.
- 23- Hatem, Op, Cit, P. 20.
- 24 -Al-Ashaash, Op, Cit, P. 161.
- 25-The IEEE Global Initiative on Ethics of Autonomous and intelligent system, Reframing Autonomous Weapons System, Creative Commons Attribution – Noncommercial, USA, 2017, P. 3.
- 26-Fredrik Von Bothmer, Missing Man:Contextualizing Legal Reviews for Autonomous Weapon Systems, Dissertation, University of ST GALLEN, Germany, 2018, P. 10.
- 27-Bradant. Thomas, Autonomous Weapon Systems -The Anatomy of Autonomy and The Legality of Lethality, Houston Journal of International Law, Vol. 37, Issue 1, 2015,P. 6.
- 28-Tyler D. Evans, At War with the Robots: Autonomous Weapon Systems and the Martens Clause, Hofstra Law Review, Vol. 41, Issue 3, 2013, P. 6.
- 29-Fredrik Von Bothmer, Op, Cit, P. 11.
- 30-Kenneth Anderson, Daniel Reisner and Matthew Waxman, Adapting the Law of Armed Conflict to Autonomous Weapon Systems, Published by the International Law Studies, US Naval War College, Vol. 90, 2014, P. 2.
- 31-Armin Krishnan, Killer Robots: Legality and Ethicality of Autonomous Weapons, Ashgate Publishing Company, England, USA, 2009, P. 15.
- 32-Michael N. Schmitt, Jeffrey S. Thurnher, Out of The Loop: Autonomous Weapon Systems and The Law of Armed Conflict, Harvard National Security Journal, Vol. 4, 2013, P. 332.
- 33-United States of America, department of defense, Defense Science Board, Task Force Report: The Role of Autonomy in DoD Systems, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, Washington, July 2012, P. 31.
- 34-Michael W. Byrnes, Nightfall: Machine Autonomy in Air-to-Air Combat, Air & Space Power Journal, May- June 2014,P. 54.
- 35-DesonJason S., Automating the Right Stuff? The Hidden Ramifications of Ensuring Autonomous Aerial Weapon Systems Comply with International Humanitarian Law,the Air Force Law Review, Vol. 72, 2015, PP. 85-122.
- 36-Peter Asaro, On Banning Autonomous Weapon Systems: Human Rights, Automation and the Dehumanization of Lethal Decision-Making, International Review of The Red Cross, Vol. 94, No. 886, 2012, P. 687.
- 37-Douglas A. Pryer, The Rise of the Machines: Why Increasingly 'Perfect' Weapons Help Perpetuate Our Wars and Endanger Our Nation, Military Review, Vol. 93, No. 2, 2013, P. 14.
- 38-Autonomous Weapons, An Open Letter from AI [Artificial Intelligence] & Robotics Researchers, Future of Life Institute website, 28 July 2015.
-

- 39-Gary E. Marchant et al, International Governance of Autonomous Military Robots, the Columbia Science and Technology Law Review, Vol. 12, 2011, PP. 272-276.
- 40-Autonomous Weapons, An Open Letter from AI [Artificial Intelligence] & Robotics Researchers, Future of Life Institute website, 28 July 2015.
- 41-Report of the Special Rapporteur on Extrajudicial, Summary, or Arbitrary Executions, Christof Heyns, 9 April 2013, United Nations Human Rights Council, 23rd Session, Agenda Item 3, United Nations Document A/HRC/23/47.
- 42-International Committee for Robot Arms Control (ICRAC), "the Scientists' Call to Ban Autonomous Lethal Robots, October 2013.
- 43-Shane R.Reeves and William J.Johnson, Autonomous Weapons: Are You Sure These Are Killer Robots? Can We Talk About It?, The Army Lawyer, April 2014, PP. 25–31.
- 44-Noel Sharkey, Saying 'No!' to Lethal Autonomous Targeting, Journal of Military Ethics, Vol. 9, 2010, PP. 369- 383.
- 45-Kenneth Anderson and Mathew C. Waxman, Law and Ethics for Robot Soldiers, Policy Review, Vol. 176, December 2012, P. 46.
- 46-Salwa Youssef Al-Akyabi, Self-Employment Rules among Start-ups and Compliance in Light of International Law Requirements, Journal of Law for Simple Research, Alexandria University, Faculty of Law, Egypt, Issue 1, 2019, P. 587.
- 47-Kenneth Anderson and Mathew C. Waxman, Law and Ethics for Autonomous Weapon System: Why a Ban won't work and How the Laws of War Can American University Washington College of Law, Research Paper No. 11, 2013, P. 11.
- 48-Al-Akyabi, Op, Cit, P. 587.
- 49-Report of the ICRC Expert Meeting on Autonomous Weapon Systems: Technical, Military, Legal and Humanitarian Aspects, 2014, P 80. Available at https://www.icrc.org/sites/default/files/document/file_list/4221-002-autonomous-weapons-systems-full-report.pdf
- 50-Kelly Cass, Autonomous Weapons and Accountability: Seeking Solutions in the Law of War, Loyola of Los Angeles Law Review, Vol. 48, Number 03, 2015, P. 1034-1035.
- 51-Al-Ashaash, Op, Cit, P. 163.
- 52-Rawabhi Omar, Application of International Humanitarian Law to Asymmetric Armed Conflicts, PhD Thesis, Faculty of Law and Political Science, University of Oran, Algeria, 2017/2018, P. 179.
- 53-Marco Sassoli, International Humanitarian Law in Contemporary Armed Conflicts: Autonomous Weapons and International Humanitarian Law, ICRC Publications, Geneva, no year of publication, Vol. 90, 2014, P. 155.
- 54-Noel Sharkey, Grounds for Discrimination: Autonomous Robot Weapons, RUSI Defence System, 2008, PP. 88- 89.
- 55-Noel Sharkey, The Evitability of Autonomous Robot Warfare, International Review of the Red Cross, vol. 94, no. 886, Summer 2012, PP. 787- 799.
- 56-MarcoSassoli, Op, Cit, P. 328.
- 57-Dill J.Remarks by Janina Dill, Interpretive Complexity and the IHL Principle of Proportionality, Proceedings of the ASIL Annual Meeting (American Society of International Law), Vol. 108, 2014, p. 83.
- 58-Noel Sharkey, Automated Killers and the Computing Profession, IEEE Computer Society Press Los Alamitos, Vol. 40, Issue 11, USA, 2007, P. 123.

- 59-United Nations, Report of the Special Rapporteur on extrajudicial, summary or arbitrary executions, Christof Heyns, Document No. (A/HRC/23/47), United Nations, New York, Geneva, April 2013, Par. 30.
- 60-Human Rights Watch, Losing Humanity: The Case against Killer Robots, November 2012, PP. 32- 33.
- 61-Markus Wagner, Autonomy in the Battlespace: Independently Operating Weapon Systems and the Law of Armed Conflict, in International Humanitarian Law and the changing Technology of war, 2012, P. 112.
- 62-Marco Sassoli, Op, Cit, P. 331.
- 63-kasmi Amel, Weapons Enhanced by Artificial Intelligence Technologies in Light of International Humanitarian Law, Algerian Journal of Law and Political Science, Vol. 8, No. 1, 2023, PP. 220.
- 64-David Leslie, Understanding Artificial Intelligence Ethics and Safety: A Guide for the Responsible Design and Implementation of AI Systems in the Public Sector, The Alan Turing Institute, 2019, P. 65.
- 65-Benjamin Kastan, Autonomous Weapons Systems:A Coming Legal “Singularity”?,Journal of Law- Technology and Policy, University of Illinois,College of Law,Vol. 2013, No 01, P. 55.
- 66-Kelly Cass, Op, Cit, P. 1033-1034.
- 67-Al-Ashaash, Op, Cit, P. 162.
- 68-Jean-Marie Henckaerts et al., Customary International Humanitarian Law, volume 01: rules, Cambridge University Press (2005), pp 51-68,available at:<https://www.icrc.org/sites/default/files/external/doc/en/assets/files/other/customary-international-humanitarian-law-i-icrc-eng.pdf>
- 69-International Committee Of Red Cross, ICRC position on autonomous weapon systems, 2021, Available on [:https://www.icrc.org/sites/default/files/document_new/file_list/icrc_position_on_aws_and_background_paper.pdf](https://www.icrc.org/sites/default/files/document_new/file_list/icrc_position_on_aws_and_background_paper.pdf)
- 70-Ibid.
- 71-International Committee of Red Cross, ICRC position on autonomous weapon systems, 2021, opcit.