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The impact of the digital military revolution on modern warfare: Russia's war on Ukraine as a model

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Abstract:

The digital revolution in military affairs has caused repercussions within the military sector and strategic thinking by moving from the traditional concept of Clausewitz, which is based on the rule of combat and confrontation in the physical field, to the concept of Sun Tzu, which focuses on the knowledge base and reducing dependence on the human element and combat in the cyber field. The progress in technological means and information systems has changed the form of confrontation and led to the emergence of new forms of war. The Russian-Ukrainian war is a clear example of this transformation. The study found that the war has changed not in its nature but in the way it is fought, through Using the contents of the digital revolution in the operational field has enabled Russia to adapt to the situation on the ground. However, it still faces challenges at strategic level of the war.

Keywords: digital RMA; modern war; smart weapons; Russia; Ukraine.

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Introduction:

The past decade has witnessed rapid developments in computing and information technology. This has led to profound changes in almost all areas, particularly in the military and security spheres of many countries. This has been reflected in the evolution of this aspect in shifts in the level of methods of fighting and the construction of armies, mainly due to developments in the patterns of war and the development of strategic thinking in line with the realities.

The attempt to study the impact of the transition to the information age on the military side resulted during the 1990s in an evolution of the idea of revolution in military affairs. This idea has emerged from technological innovations that have increased the quality and precision of military means, In recent years, there have been other more advanced and complex technological developments in the field of war that have led to changes in the characteristics of the battlefield as well as in the patterns of armies, The objectives of the traditional war went beyond the achievement of field victory on the battlefield, the defeat of the aggressor State, the control of the disputed area, the overthrow of the regime and the obligation of adversaries to modify behaviour. To fight wars in accordance with following principle of achieving the State's national interests by preserving survival, security, support for stability, enhanced influence, and the extension of regional and international strength and prestige. On this basis, major States have adopted Croatia's principles of warfare management and the conduct of battles in the theatre of military operations on information technology.

The tremendous technological progress has brought about a qualitative shift in the structure of military revolutions, whether at the level of organization of the armed forces or in terms of the nature of war itself. This is reflected in the radical change in the method of waging wars, which have become dependent on advanced high-tech weapons followed by inevitable changes in military operations and tactics, transformation in doctrine and organization of forces, and the transition from large numbers of traditional armies to smaller smart armies. This is clearly reflected in the Russian-Ukrainian war, as Western military supplies of advanced and intelligent weapons changed the course of the war against Russia, which relied on a large number of armies and weapons Accordingly, we find that various major developments in the information technology industry have contributed to

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the emergence of smart systems and weapons, which have quickly become part of the new methods of combat. These smart weapons shorten the interval between determining the target time and the time of attack. They have also reflected in the doctrine of using armies through artificial intelligence applications and programs as they have developed small and smart weapons.

1. Problematic study:

Based on the above, the following problems can be raised: how did the digital revolution affect the course of the Russian-Ukrainian war?

2. Study hypothesis:

The greater the military use of digital technology the more it changes the strategy of war and the way it is fought.

3. The importance and Issues of the study:

This study aims to learn about the most important technological developments in the military field, which have led to profound changes in the nature and dimensions of wars and the various strategies for their implementation on the battlefield. It also aims to learn how the Russian army deals with the new type of war by blending traditional and modern methods of warfare with the aftermath of this war.

4. method and materials

The study discusses the main literature on the subject to identify the changes brought about by the digital revolution in military affairs on the concepts and content related to the cognitive aspect of military science, using a historical approach that studied the evolution of the study variables, and a case study approach to focus on Russian war on Ukraine at all levels through the lens of the digital revolution in military affairs.

1- The digital revolution in military affairs and its relationship to modern wars.

1.1- Definition of digital the digital revolution in military affairs:

Former US Secretary of Defense William Cohen states, "The revolution in military affairs occurs when the size of the State army provides an opportunity to change its military strategy and doctrine through training, education, the

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organization of equipment, operations, and tactics to achieve decisive military victories in new ways." wich ability to change its approach in terms of organization, training, equipping and so forth in order to achieve its desired objectives.

Andrew F.Krepinvich considers that the revolution in military affairs is what the application of new technologies to Several military information systems creates with operational concepts and organizational adjustments to radically change the nature and behaviour of the conflict[1], and Andrew F.Kripenvich has identified four elements of the digital revolution included in military affairs to be understood as a revolutionary shift in the management of war the war and the way it is fought: technological change, systems development, operational innovation, and organizational adjustment[2].

The digital revolution in military affairs is driven by structural changes in the international system. high investment in military expenditures, significant advances in information and communication technology, and the integration of these military, ideological, and technological factors into new military structures and tactics, It is the process of developing the theoretical and applied aspect of methods of warfare through technological innovation in the military system and equipment, which in turn affects the operational and organizational concepts of the armed forces in terms of the management of military operations and a change in the manner and manner of fighting.

1.2- Digital Revolution and Modern War:

The concept of war has witnessed several developments in tools and methods, as reflected in its own connotation. laws and the conduct of war and the calculation of losses and gains therein, On the merits of victory and defeat in war, as the applications of the industrial revolution in the field of war emerged from the mid-nineteenth century, the concept of an all-out war for the availability of its technical potential gradually emerged. The first half of the twentieth century also saw the outbreak of two world wars. Nuclear weapons and other weapons of mass destruction have emerged to be a decisive and new factor in determining the balance of power. the military, which constituted a second revolution at the military level[3], with enormous technological advances affecting the military revolutionary environment in terms of the organization of the armed forces and the nature of the war itself international relations, especially since the end of the

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Cold War, which has governed international relations for decades, Modern wars have thus been identified from the perspective of the Revolution in military affairs in four areas:

a. Precision Strike:

It is the ability to identify and destroy with high precision vital objectives, whether fixed or mobile, during an important operational and strategic period while minimizing damage and counter-enemy attacks[4].

A precise strike as à modern war area relies heavily on technical progress to accurately identify targets, countermeasures, communications, data processing, rocket firing systems, smart munitions, target detection device devices, and location identification. The development of this area requires continuous follow-up and development in the integration of data, mission planning, and assessment of battle losses[5].

The 1991 Gulf War was the first experience of precision strike capabilities by integrating control, communication, reconnaissance, cyber-fighting, and stealth techniques, which allowed the United States military to quickly triumph and resolve the battle with few casualties[6].

b. information warfare:

Information warfare is one of the most important and dangerous fields in modern warfare, and it is linked to information systems, their capabilities, and their impact on military systems and operations[7].

It is any action taken by the forces to reject, exploit, spoil, or destroy the enemy's information and functions, and to protect himself from those measures and exploit his military information[8].

c. Dominating Maneuver:

The superior manoeuvre has always been one of the most important elements of military operations and principles of war, and the revolution in RMA military affairs has brought a new dimension to it and provided it with the capacity to implement widely in the world's theatres of operations in a short time and using low forces[9]. It is defined as the precision-strike positioning of troops and control of the battlefield in the information war to attack sensitive areas to destroy the enemy's positions of gravity and achieve important military objectives.

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d. Space War: Space Warfare

Space warfare is defined as one of four areas of warfare: land, sea, air, and the fourth is Cyber Space and Information, based on the exploitation of the space ocean to manage large-scale military operations within a short time frame[10].

The Space Force is an important area of American national security, including satellites launched to gather intelligence, control weapons, and navigation in ways that are indispensable to American defence.

The digital revolution in military affairs is driven by structural changes in the international system. high investment in R & amp; D, military expenditures, significant advances in information and communication technology, and the integration of these military, ideological, and technological factors into new military structures and tactics, It is the process of developing the theoretical and applied aspect of methods of warfare through technological innovation in the military system and equipment, which in turn affects the operational and organizational concepts of the armed forces in terms of the management of military operations and a change in the manner and manner of fighting to achieve the desired military impacts and objectives to meet the challenges and demands posed by the strategic environment.

Just as space has become an essential place for military operations, it is imperative that it also become a future battlefield because of increased competition for satellite orbits and gravity centres, and the ability of enemies to strike the Earth's objectives from this space[11].

2. The role of the information technology worker in the digital revolution in military affairs.

2.1- The evolution of the military industry.

There is a complex relationship between the military and technical community due to developments in the sixties of the last century that represented the military field as the main market for information technology[12].

Among the most significant technological developments in the military field are the following:

2.2- D Printer: Additive Manufacturing:

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3D printers are used to produce fighter jet engines, as well as spare parts for some weapons such as tanks and dives, many countries in the world have realized especially the armies of major powers.

The benefits of three-dimensional manufacturing[13] which has shifted from a mere hobby to an industry that produces an infinite range of products have constituted a major transformation of manufacturing, perhaps a modern top 10 list includes: metals such as stainless steel, bronze, gold, aluminium, ceramics, and nuclear pipes as well as another range of materials.

Recent technological developments have shown that the industry increase the speed of this printing to increase production, and in January 2015 the electronic printing company unveiled a new printing that prints operational drones complete with electronics and engines[14].

2.3- Nanotechnology:

China was the first to pay attention to nanotechnology and its military uses even before the end of the cold war in 1986, when the general wrote "Sun Belin Beilin Sun", Chinese Academy of Military Sciences, an article entitled "Nanotechnology Weapons in future battlefields", in which he described the potential applications of this technology in future wars, prompting China to implement several research programs aimed at developing new and diversified nanotechnology-based technologies such as the National Research and Development Programme in Advanced Technology and the National Programme for Basic Research[15].

To move interest in this technology to the United States of America that used nanotechnology to promote existing weapons types, for example, a patent was registered in 2009 for a sophisticated armour-piercing missile consisting of nanoparticles The United States military accounted for 90% of global military expenditure on nanotechnology research and development in the world in 1995[16], and in 2001 established the National Nanotechnology Initiative (NNI) to promote nanotechnological research in several government entities. and invested nearly $1 billion in the 2014 fiscal year.

2.4- Space and Space-Like Capabilities:

The availability of continuous surveillance in space provides information for the use of these new technologies in space. For example, Google Skybox Satellite

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Imaging aims to market services that provide high-resolution images. and other companies are working on systems that can replicate the communications and surveillance functions provided by satellites using systems that operate in the Earth's atmosphere such as the Google Loon Project, the company seeks to provide Internet services at the lowest cost to most parts of the Southern Globe by deploying a series of balloons that transmit signals to the Earth[17]. the strategist Paul Rosenzweig noted that Russia, China, and Iran are the three strongest U.S. competitors in this area, as Moscow is the most advanced of Beijing in cyberspace conflict.

2.5- Artificial Intelligence: Artificial Intelligence

Deadly slaughter bots, also called "lethal autonomous weapons systems", are weapons that use artificial intelligence to identify, select, and kill human targets without human proof[18]. Today's smart weapons include a series of targeted and precise weapons[19], which are the application of smart force by firing precision-guided ammunition (Awareness of the battlefield), through surveillance aircraft, unmanned aerial vehicles, satellites, individual warhead missiles, the British (GPS) cruise and tomahawk missile which can hit a target the size of a small room a thousand miles away, and smart weapons have greatly increased destructive power than they were yesterday[20].

Artificial intelligence and modern technology will change the method of warfare but will not change its nature, and war will continue to be politically motivated and composed of three core functions that recruit learn in initial training: move/shoot/call, and the movement in war includes hiding and research and attackers try to avoid exposure and defenders try to find their whereabouts. In terms of penetration and repulsion, attackers try to penetrate enemy territory, while defenders try to prevent them from arriving. Disappearance and penetration are not easy in war unless they are impossible and thus attacking and defending in the virtual field is more difficult and uncontrollable[21].

2.6- Drones:

The United States, Germany, and the United Kingdom were the first countries to use them in their armies, followed by the Soviet Union in the 1930s. The Second World War and the 1950-1953 Korean War allowed for use by the United States for training purposes, as guided missiles and in countering piloted warplanes, each was used for each of these purposes once So I produced about

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15,000 planes across a factory located in southern California. Her role in the intelligence field emerged after the 1955-1975 Vietnam War, and was also associated with the use in the 1999 attack on Kosovo when she was first provided with rockets[22].

3. The shift in military doctrine and the organization of armies.

The revolutionary strategic thinking base of the military doctrine of the digital age is based on the art of combat operations and tactics based on the idea of developing combat capabilities and operational and logistical capabilities to wage war against a nuclear-armed enemy (specifically in Europe), but without resorting to the use of nuclear weapons. War winning is only possible if the combat doctrine enables the armed forces to take the initiative to control the strategic environment and keep the enemy under control and in the crossfire of the attack. Those conceptual elements of the digital revolution in military affairs were embodied in the 1991 Gulf War[23], Through targeted surveillance, support resolution and armaments systems, careful control, and improved coordination in the depth and width of the great battle.

Accurate technology has significantly intervened in changing the combat doctrine of modern armies by creating new defence priorities that rely primarily on the increasing use of modern technology in protecting the vital interests of the State, the traditional doctrine of armies was based on the idea of protecting national security and sovereignty over territory and protecting borders from possible penetrations from the enemy, but with the growing role of technology, a new component of military doctrine (of national armies) was added to protect the Siberian sphere of States from deadly threats through cyberattacks[24].

A feature of the military doctrine of the revolution in military affairs is the trend towards a joint force on land, sea, and air. In the view of Benjamin Lambeth, "Technology prompts the formation of a strong movement towards de facto joint operations". This is in two directions:

The first is a trend toward joint military Operations, and the second is a trend toward involving all branches of the armed forces in military operations. For example, the United States armed forces have acquired elements of those new systems created by the Technological Information Revolution. In the United States Navy, there is a system called "coherent cooperation capability" that allows

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many warships to combine their radars into a single, more powerful radar, enabling commanders to track everything that happens on the battlefield[25].

The Revolution's military doctrine thus focuses on technological use and directs it towards the development of capabilities that contribute to rapid victory. The new military doctrine is also based on the idea that since the end of the Cold War, military power, especially for the United States, has tended to influence the will and perception of the opponent. The concept of trauma and intimidation, achieved through rapid domination, has been launched by Rapide dominance and requires a merger that will lead to full integration of land, maritime, air, and space components and sectors based on geographical, tactical, and political realities.

4. Russian military performance in the war on Ukraine.

The reasons for the Russian-Ukrainian war are the conflict of economic and political interests between the two countries and Ukraine's attempt to join the North Atlantic Treaty Organization (NATO) and the European Union and to declare its intention to possess nuclear weapons, prompting the Russian President to launch a military operation to disarm Ukraine.

4.1- Russian military strategy in Ukraine:

The Russian War was prepared years ago and was evident to followers and military experts and has escalated since the West's insistence on the annexation of Ukraine into NATO. President Putin ordered the dispatch of Russian troops to Ukraine in what he described as the task of maintaining peace. The Russian leadership views Ukraine as part of its sphere of influence.

4.2- Opening strikes:

Russian forces used the ballistic Kinzhal missile to bomb cadastral targets, especially airports, and destroyed a factory producing parts of ballistic missiles The Russian Ministry of Defense announced in October 2022 that the Russian missile system was Alexander targeted three Ukraine army command posts[26], and used smart hypersonic cruise missiles capable of delivering fatal strikes against ships, aircraft carriers and dives. Hypersonic missiles also give a significant military advance to Russia thanks to their ability to carry nuclear warheads and Russia’s fifth-generation diving capability to launch40zirconic missiles simultaneously at the united states-based armed forces observation post that operate missile systems deployed in Europe in case Washington uses it to attack

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Russia in addition to the maneuvering factor offered by the launch of zircon launch tests from the warship, specifically from admiral Gorshkov energy, it is launched from the same winged Kalibr missile platforms without the need to create new platforms and Moscow is working to build 12new caps of the admiral Gorshkov project by 2020. Each vessel will carry 48 zircon missiles, a type that currently no missile defense system can stop against air defense and electronic warfare systems[27], and has achieved an excellent result with full air defences with accuracy, speed and west licences compared to the air strike, which will change these global tactics.

4.3- Qualitative aerial superiority:

By focusing on the possession of sophisticated multi-mission combat aircraft of models (Sukhoi, meg, and mei in the helicopter) that entered service in the Russian air force in December 2020 to compensate for weakness in other areas.

The characteristics of these drones, known as 5G fighters, include:

- Ghostly or hidden munitions hanging in inner incubators.
- The high amount of manoeuvre from short distances.
- Flying at sound speed for long periods without using a backburner.
- Advanced aviation electronics, including the LPIR radar, and integration of data over networks allow familiarity with the surrounding situation on the battlefield.
- Multi-role capabilities are similar to C3 command, control, and communication capabilities.
- Powerful engines that drive low heart in the exhaust do not operate within them anti-aircraft missiles[28].

to counter NATO's quantitative and qualitative aerial superiority, Russia used SS300.400 and 500 missiles to confront NATO aircraft and to constitute a large and multiple interception range from within and outside Russian territory[29].

4.4- above conventional weapons:

The Russian army has used conventional weapons, the most important of which are:

a. Drones:

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Drones played an important role in the Ukrainian War, they were among the most prominent tools in the war and a dangerous player who changed the course of the battles, as it emerged that Ukrainian forces drones extensively in the early stages of the war to monitor Russian army convoys and hit their vehicles through ambushes in which clear role of aircraft appeared. The most notable appearance of Russian drones was the strike reported by the Russian Ministry of Defence in March 2022, where drones of « Orion » type were launched. (with a range of 250km, height of 7500m, and operational capacity of up to 48h) to target military and vital positions through reconnaissance, information gathering, attack execution, and combat Air Artillery and missiles prompted major powers such as the United States and Europe to increase technology research and development efforts to fight and shoot down a large number of hostile Russian drones[30].

b. hypersonic weapons:

Russia deployed a hydroacoustic missile system, represented by the Kinzhal missile, which was launched by air from MiG-31 aircraft and sped up to 10Mach, while at 2.000 km, Kinzhal designed to eliminate land and sea targets, as a result of its high manoeuvrability, radar penetration, and nuclear warhead carrying capability[31].

c. Laser weapons:

Russia relied on two high-resolution prevent systems capable of repelling air attacks and destroying satellites in their range, and the Russian naval laser weapons(filin5p-42) directed jamming through optical interference technology[32].

Russia also planned and was successful in the heavy use of ballistic and cruise missiles, while rushing to end its ultrasound tests, but did not achieve sales success in using drones unlike Ukraine, which led Russia to acquire drones from abroad, especially Iran and Korea.

d. Cyberarms:

Russia has used cyberspace extensively, with some US reports indicating that Ukraine has suffered more than than150cyberattacks since the start of the war on 24 February 2022, classified by the section « security threats at Microsoft were organized as destructive cyberattacks targeting Ukraine’s cyber infrastructure via a software « fox blade », which is harmful to decoupling Ukrainian devices from the internet and scanning their data[33]. Also expanded Russia in this area but was

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confused when the West stopped the system GBS paralysed most vehicles, especially tanks, before successfully operating its replacement system, glonas, which faced new Western cyber-attacks.

Since the beginning of the Russian war on Ukraine, the military superiority of Russian forces over their Ukrainian counterparts has been evident, but the use of drones by Ukrainian forces has provided a new opportunity for Kyiv to modify the significant power imbalance between Russia and the imbalances of war.

4.5- Russia’s strategic impasse in Ukraine:

It has been 25 months but there is no indication that the war is coming to an end either through a negotiated settlement or the defeat of one of the parties to the battle. so that the West and the United States of America continue to support the Ukrainians with high-quality smart weapons, enabling them to withstand the Russians as well as the ability to repel strikes and deplete the capabilities of the Russian forces, On the other hand, Russia continued its offensive and made progress in important areas arms reserves ", while seeking supplementary supplies from some allied States to compensate for the shortfall in arms reserves.

In its use of this type of hybrid warfare, Russia focused on employing information warfare, as it made concerted efforts to escalate its online presence and use social media to launch public influence campaigns. The Russian and Belarusian information operations accompanying the invasion included operationd enabled- cyber, Assrt Estabilished, and leak-and-hack operations, using a sophisticated campaign infrastructure and a range of vectors used by identified Russian-allied actors[34].

As a result, many questions have arisen about the causes of this war and its strategic repercussions on Russia because:

4.6- Exposing the weaknesses of the Russian military:

the Russian army's operational techniques, both aerial and ground, have proved to be significant shortcomings in front of the Western materiel received by Ukraine from the United States and some European countries Russia's resort to the purchase of millions of rockets from North Korea and thousands of Iranian drones is proof of this, In addition to the Ukrainian's ability to shoot down Russian and Iranian drones with the most basic aerial resistance tools from American and

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Western technologies in general, despite the deployment of an aircraft (Su-57 Felon Fighters), its participation in the battles against Ukraine according to Russian official sources as well as the use of Kinjal hypersonic missiles and the launching of Admiral Gorshkov's frigate into the ocean, does not preclude the question of Russia's ability to continue in its position as a top producer of the advanced weapon, All of Russia's pride today in sophisticated, state-of-the-art and high-precision weapons has proved relatively insufficient in the face of the Western defensive weapons used in Ukraine[35].

The Russian invasion of Ukraine exposed the weaknesses of the Russian army, which are particularly lurking in the deterioration of the level of training of soldiers and coordination between the various weapons systems[36]. "Since the beginning of the war in Ukraine, battles between the two sides have shown a discrepancy in command in Favor of the Ukrainian army, although it is smaller than the Russian army and less armed[37]. Despite the Russian use of superior military equipment and firepower, which may enable troops to control the territory, it is far less effective than the successful management of that territory[38].

4.7- Russian leadership failure:

A relative decline in President Putin's popularity was observed in the latter half of 2022 and a change in the mood of public opinion towards war, and a concerted trend in favour of negotiation, especially after the announcement of partial mobilization, which called for the focus of efforts to achieve any victory whatever its symbolism, Which Russia has not been able to accomplish through Russian army operations alone. Unofficial forces are indirectly associated with the regime[39].

4.8- Shifts of war:

The first weeks of the Russian-Ukrainian war were based on Soviet military principles aimed at achieving strategic control and inflicting heavy losses on the Ukrainian army including the blockade of the entire capital, Kyiv, and thus the return of the Ukrainian State to the Russian sphere of influence and thus the complete separation of Ukraine from the West[40]. So Russian forces used many high-quality destructive weapons but for the solidity of Ukrainian resistance supported by Western military supplies the Russians could not achieve a total attack as a result the war in Ukraine tended to turn into a war of positions and trenches rather than an offensive war, and it is not clear whether one of the parties

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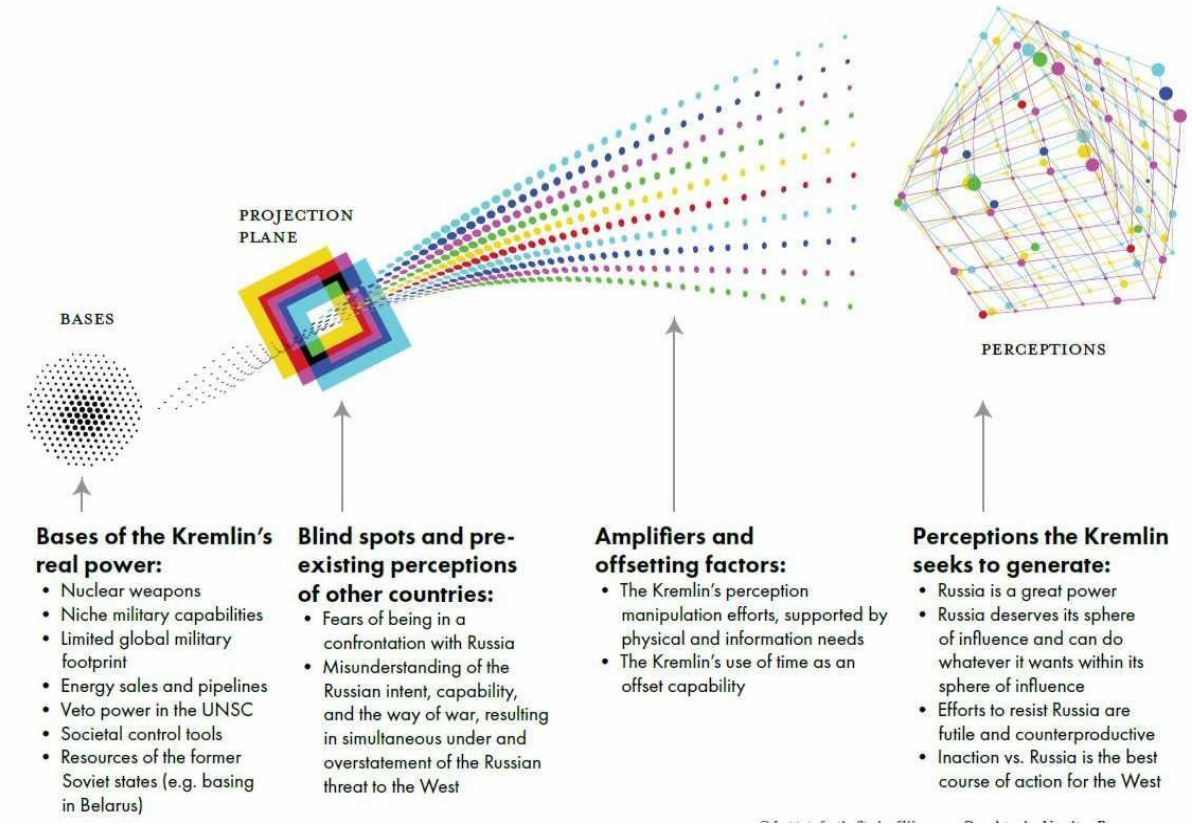
will achieve a landslide victory in the war, Each party works to exhaust the counterparty and bring it to the stage of acceptance of negotiation. Economic and social crises caused by inflation, high fuel prices, transport, and the collapse of European Union Governments under social resentment, and in return social resentment, America supports Ukrainian forces' steadfastness against Russians without empowering Ukrainian forces with sufficient military capabilities to achieve field victories.[41]

Figure: 01 The Kremlin's perception of Russia



Source: Nataliya Bugayova et al, Denying Russia's Only Strategy For Success, ISW Press, March 27, 2024, https://www.understandingwar.org/backgrounder/denying-russia%E2%80%99s-only-strategy-success

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Conclusion:

Dramatic technological advances have made a qualitative shift in the structure of military revolutions both at the level of the organization of the armed forces and at the level of the nature of the war itself This is reflected in the radical change in the way wars are waged, which have become dependent on sophisticated high-tech weapons, followed by inevitable changes in military operations and tactics, a shift in the doctrine and organization of forces, and a transition from conventional armies with large numbers to smaller smart armies, This is so evident and evident in the Russian-Ukrainian war that Western military supplies of sophisticated and intelligent weapons changed the course of the war against Russia, which relied on a large number of military and destructive weapons, and therefore, the various major developments in the information technology industry have contributed to the emergence of smart systems and weapons, which have quickly become part of the new methods of combat. These smart weapons shorten the interval between target time and attack time It also reflected the doctrine of using armies through AI applications and software by developing small and smart weapons that can provide satisfactory results when used in warfare confrontations such as drones that proved successful as an effective weapon in the war against Ukraine.

The Russian-Ukrainian war is characterised by the characteristics of the new dimension of warfare, the "third wave", which is known as Hybrid Warfare, dominated by psychological aspects, propaganda and media, cyber warfare, economic tool and military intervention, and in the future the field may expand to include other tools, and these strategies are greatly intertwined thanks to technological development and may sometimes be difficult to separate them from each other, and these tools have clearly emerged within the Russian-Ukrainian hybrid war.

Russia has clearly adopted a new generation warfare approach against Ukraine, which relies on Russia's concept of information operations. They are part of Russia's approach to hybrid warfare, which consists of a deliberate disinformation campaign supported by actions from intelligence services and designed to confuse the enemy and achieve strategic advantage at minimal cost. The nature of hybrid operations makes them very difficult to detect or even identify their onset, given that confusing the enemy is one of their core components. However, it has become clear that Russia is utilising information operations techniques to support its hybrid warfare efforts.

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