

# AI Singularity and the Growing Risk of Surprise

## Lessons from the IDF's Strategic and Operational Learning Processes, 2014-2019

By Meir Finkel

For decades, scholars have pondered the likelihood and effect of computers surpassing human intelligence, often referred to as the singularity. For militaries, artificial intelligence (AI) singularity will be a double-edged sword. We should seek to achieve and employ it, while denying our adversaries the opportunity to do so. When AI singularity does emerge, it will likely have profound implications for tactical capabilities, as well as strategic and operational decisionmaking. U.S. adversaries, including both China and to a lesser extent Russia, will seek to take advantage of the new possibilities AI singularity offers. This article focuses on countering these effects. While the emerging technologies are novel, the need for adaptation is perennial. I will base my recommendations on recent developments in the Israel Defense Forces (IDF) “learning machine,” which were aimed at enhancing its ability to cope with the accelerated evolution of its adversaries in the Middle East.

In her study “Battlefield Singularity: Artificial Intelligence, Military Revolution, and China’s Future Military Power,” Elsa B. Kania identified several capabilities the Chinese are looking to enhance by leveraging AI, including “AI-enabled data fusion, information processing, and intelligence analysis; war-gaming, simulation, and training; defense, offense, and command in information warfare; and intelligent support to command decision-making.” She notes that some Chinese thinkers anticipate a “‘singularity’ on the battlefield, at which human cognition can no longer keep pace with the speed of decisionmaking and tempo of combat in future warfare” and that the “PLA could prove less adverse to the prospect of taking humans ‘out of the loop’ to achieve an advantage.” This development could present a strategic challenge to the United States, she argues. Kania urges the U.S. military to prepare for a future in which the United States may no longer enjoy a clear technological edge, especially by focusing on “the human factors and organizational capacity that are critical determinants of successful defense innovation.”<sup>1</sup>

Although it may seem that AI singularity will mainly affect military capabilities at the tactical level, through robotic swarms for example, Kania asserts that “... the PLA may focus on leveraging AI to enhance command and control at the operational and even strategic levels of warfare through intelligent assistance to command decisionmaking, even seeking to enable decisionmaking at machine speed.”

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This article focuses on the “human factors and organizational capacity” through an Israeli lens. Though we do not know if and when AI singularity will be achieved, nor by whom, I will present an approach to strategic and operational learning processes that can accelerate the ability both to exploit AI and to minimize its effects when employed by adversaries. Then I will deal with measures aimed at better responding to the rising possibility of AI-based technological and doctrinal surprise.

The recommendations presented here are based on new Israeli practices developed as part of the learning competition between the IDF and its adversaries from 2014 through 2019. They were not designed to deal directly with AI singularity but can offer insights on individual and organizational military learning and counter-surprise capabilities.

### The IDF “Learning Machine”

The IDF’s need to adapt and change has increased significantly in recent years due to four medium-scale campaigns (2006, 2008-09, 2012, 2014) and numerous small-scale engagements against “hybrid” learning networks, which in recent years include Iran, Hezbollah, the Syrian regime (backed by Russia), Hamas, Islamic Jihad (in Gaza), the Islamic State (in Sinai), Jabhat el-Nusra (on the Syrian Golan Heights), and others. The furious pace of change demanded rapid strategic assessments and operational concept development (for the northern theater), rapid strategic and operational decisionmaking before operations in all theaters, and a higher pace of IDF learning and adaptation to new tactical methods and technological capabilities employed by Israel’s adversaries.

Those challenges forced the IDF to develop innovative, new learning and adaptation practices, the main elements of which were:

- A strategic and operational learning accelerator—The Dado Center<sup>2</sup> for Interdisciplinary Military Studies;
- An educational effort focused on learning and changeability that teaches the Design Learning Approach;
- Training scenarios that push uncertainty to the limit and demand real-time adaptation, from platoon leaders to the IDF Chief of Staff;
- A wartime Lessons Learned system that demands a 24 hour response time to change, be it in organization, procedures, or training;
- Organizational changes that push knowledge development, including the Depth Command and Commando Brigade, Cyber apparatus, the new J5 innovation and experimentation division, and an experimental multi-domain unit.

### *The Dado Center as a Strategic and Operational Learning “Accelerator”*

The mission of the Dado Center for Interdisciplinary Military Studies, which I commanded from June 2014 until June 2019, is “To be the IDF expert for strategic and operational level learning and knowledge development processes, to develop the field, to assimilate it in the IDF, and to assist IDF bodies in its implementation.” It belongs to IDF J7/J3 and was founded after the Second Lebanon War (2006), rooted in the Operational Theory Research Institute (OTRI). In the years immediately after the 2006 war it focused on the education of senior officers in systems thinking. In 2014 it started hosting strategic and operational level learning processes, based from 2015 on the revised Design Approach the IDF formulated.

While the Design Approach implemented by the U.S. Army in recent years focuses on the operational level and begins by identifying “outer” changes in reality, the Israeli approach focuses both on the strategic and operational levels and devotes substantial attention to the recognition of blue side “relevancy gaps” before looking for the best way forward.<sup>3,4</sup>

At the core of the learning process stands the assumption that the pre-existing or current concept is inadequate for the emerging challenge. Therefore, in every learning process, the first step is to critically examine the gap between our current concept, organization, and doctrine and reality. In other words, the process begins not with the direct analysis of the red side, an approach deeply embedded in the DNA of military officers. Rather it begins with an analysis of blue side challenges in recognizing the need to adapt to changes made by the red side (or changes in the international community, military technology, etc). This is initiated by challenging the commander's or organization's basic assumptions and beliefs; how they are manifested in our patterns of action, our organizational structure, and our patterns of behavior and learning. Only after the commander and his staff recognize this gap, can a learning process aimed at creating a relevant operational concept or future concept begin.

Based on the system analysis and structured critical analysis described above, the process continues looking for “potentials”—the positive and negative possibilities embedded in an emerging system and upon which it would be prudent to act in order to influence them in our favor for the creation of the desirable future system. Potentials can come in a variety of forms—enemy vulnerabilities, emerging technological capabilities, possible international treaties, and others. Based on our new improved understanding of the challenges, adaptation to this point, and the potentials we identified, a preliminary strategy is devised. The next step is self-criticism/contrasting, in which we determine potential threats to the emerging strategy. These may be external (adversaries) or internal (objections within the IDF, for example).

Upon challenge and consolidation the preliminary strategy becomes the approved strategy. The process then continues with the development of an operational campaign concept to achieve the desired

strategy. In many cases the output goes beyond guidelines for planning following the design phase, but also includes organizational changes in headquarters, a re-focus of intelligence, and changes in combat infrastructure. Three specific aspects of this process are especially noteworthy: 1) Each process is unique and tailor-made according to the issue, organization, and commander; 2) The process demands continuous double-loop learning—on the issue at hand, and on the thought methodologies employed during the process; 3) As IDF commanders conduct design processes in the context of preparation for immediate war, the process requires the commander to “split” his personality between a hierarchy-based leadership that tries to convince subordinates of the validity of current plans/capabilities, and an open-minded process that contains uneasy leadership challenges, such as admitting that current plans and capabilities may have lost their relevance.

Based on the Design Approach, increasingly processes were conducted in recent years by commanders with the aid of the Dado Center (examples are developing a holistic approach to the northern theater, border defense of the Golan Heights, border defense of the Israel-Lebanon border, the Gaza Strip, IS in the Sinai, the Home Front, and future land warfare).<sup>5</sup> In those processes IDF generals were aided by the Dado Center's design methodology experts with research focused on their needs and war-gaming capability. The Dado Center drew lessons from every process to improve future efforts. The accelerated pace of design processes not only helped commanders develop relevant solutions to their emerging challenges but also created a better and faster “design muscle” in their subordinates and staffs who took part in the process.<sup>6</sup>

### *Educational Effort Focused on Learning and Changeability*

Based on the growing understanding within the IDF of the need to enhance strategic and operational

thinking as well as learning skills, a multi-faceted effort has been underway since 2014. It began with the Brigadier Course headed by the Commander of the Military Colleges, which taught design using a self-exploration pedagogy. Based on this course, the Dado Center created a document that was published in 2015 by the IDF J7 as the new, formal way the IDF conducts learning processes aimed at developing operational concepts.

Many adaptations in officer education have been made since 2015, following from the growing need to accelerate learning processes, and based on the formal design approach methodology. These include a change in the Dado Center's Colonels Course, aimed at educating specific position holders in the General Headquarters (GHQ), regional commands, services, and branches who lead or participate in design processes, from planning to design; the 2015 reorganization in the National Defense College's curriculum focusing on design mainly through self-experience gained by course participants through simulations; teaching the basics of design approach in the Command and Staff College for both battalion and squadron commanders and staff officers at the OF-4 rank starting in 2018. The Brigadiers Course mentioned earlier is still running. In 2018, the Division Commanders Course also began teaching part of the design process. Altogether, these represent a comprehensive educational effort within the IDF to enhance its organizational learning ability.

### *Training Scenarios that Push Uncertainty to the Limit: Counter-surprise "Vaccination"*

My recommendations on dealing with battlefield uncertainty and managing the risk of technological and doctrinal surprise come from two sources; the theoretical approach developed in my book *On Flexibility*, which deals with recovery from technological and doctrinal surprise;<sup>7</sup> and from education and training practices of the IDF that focus on flexibility enhancement.

*On Flexibility* examined how armies have recovered quickly from technological and doctrinal surprises by using a variety of abilities that come under the general heading of flexibility. These abilities are also valid here, since most of the tactical implications of AI (as defined by Kania: Intelligent Unmanned Aerial Vehicles and Swarm Intelligence; Intelligent Unmanned Surface Vehicles; Intelligent Unmanned Ground Vehicles; Autonomous UUVs; Missile Intelligentization) can result in the same kinds of surprises.<sup>8</sup>

Flexibility is built upon four strata. The first stratum is conceptual and doctrinal. Conceptual and doctrinal flexibility occurs when senior civilian officials and military officers create an organizational atmosphere that encourages lower-ranking commanders to broach ideas that challenge the official doctrine. Officers (and enlisted men and women) who come forth with original ideas augment the number of options, thus enabling the army caught by surprise to modify its doctrine and tactics. A doctrine based on this approach presents a balanced view of all forms of war and reduces the danger of getting stuck in a dogmatic rut. Here I want to emphasize that due to the future contested battlefield environment envisioned in current Western military concepts, I assume that U.S. and other military forces will have to "invent" the last 30 percent of their doctrine in the field, because everything they possess walking in will be challenged.

The second stratum is organizational and technological—combined arms units, redundancy of capabilities when dealing with major operational challenges, and technological versatility and changeability.

The third stratum is flexibility in command and cognitive skills, which is of supreme importance in modern military organizations, despite the inordinate difficulty of its implementation. Mental flexibility is an acquired cognitive trait of commanders who have learned and operated in environments that encourage



On the Yom Kippur of October 6, 1973, Egypt and Syria launched a coordinated surprise attack on Israel. Pictured here is an IDF medical crew evacuating an injured soldier from the battle field. (Israel Defense Forces, 11 October, 2005)

questioning and creativity. In the volatile conditions of the battlefield it enables a commander to adapt quickly and keep his or her wits. Flexible command expects junior commanders to take the initiative. The wide berth for initiative should enable them to come up with original solutions in surprise situations and receive their superiors' backing. Conceptual and doctrinal flexibility is the sine qua non for the development of this stratum, otherwise conditions will not be conducive to mental elasticity and decentralized command and control methods.

The fourth stratum is a rapid wartime lessons learned mechanism (see below).

The IDF exercises cognitive flexibility at almost all echelons. I will focus on the most relevant. In battalion and brigade exercises, the mission can change at the outset of the exercise, failure in

achieving missions is an integral part of the exercise, and surprise is the norm. It is important to note that battalion and brigade commanders in the IDF experience similar challenges in their operational activity in Gaza, Golan Heights, as well as the Lebanese border. The combination of training and operational experience builds command stamina which should also hold for technological surprise in war. In division exercises all the aforementioned components exist, with the addition of another component—a wartime lessons learned mechanism.

At the GHQ level a new kind of exercise was established in 2014, in addition to the yearly "IDF exercise." An annual "thinking exercise" trains the Chief of Staff—the IDF commander—and his wartime thinking forum. In these exercises—which do not involve troops—the IDF commander is



challenged with “wartime design”—accelerated efforts to develop a relevant concept of operations for the given scenario. The exercises include surprise scenarios which serve as a “mental vaccination” against strategic surprises of the kind the IDF suffered in the Yom Kippur War in 1973.

It is important to note that both aspects of IDF practices presented above are based on its strategic culture, which includes relative openness to discussing one’s conceptual and organizational relevancy gaps, and an agreed understanding that the aim of exercises is learning, not winning, and that in order to learn, the trainee has to fail, be surprised, and be challenged mentally. Any of the practices mentioned above should be adapted naturally to the culture of the military establishment that adopts the practice.

It is also important to note that the IDF uses computer-based cognitive screening which tests and gives scores to the ability of cadets in the Basic Officers Course and in the Alon Command and Staff College Course to recognize a change in the enemy’s behavior and abilities (technological and doctrinal surprises) and respond to them. Individuals who experience difficulties in this regard (or others) go through focused cognitive training in order to develop those skills.<sup>9</sup>

### *A Wartime Lessons Learned System*

The fourth stratum in the IDF flexibility approach is the mechanism that facilitates fast learning and rapid circulation of lessons so that the entire military system is updated on surprises and challenges and informed of their solutions. This stratum takes into account the need to link past, present, and future, and to rely on communications measures that permit a swift flow of information.

The arms industry is another area that can provide swift feedback enabling recovery from technological surprise. Close working relations between the Israeli armed forces and the arms industry can

counter surprises by modifying existing equipment even while the battle is still in progress.

The processing of lessons during fighting was first employed by the Ground Forces Command prior to the Second Lebanon War (2006),<sup>10</sup> then developed and employed and significantly enhanced during Operation “Cast Lead” in Gaza (2008-9).<sup>11</sup> As part of this effort a “learning while fighting” field manual was published; “learning events” were added to the division’s headquarters wartime daily routine (as part of the division tactics, techniques, and procedures); “learning officers” tasked to prepare the learning events were added to the Table of Organization and Equipment of the brigade and division headquarters personnel; dedicated training was carried out in order to prepare these officers; and a new training task was added to division exercises—identify the new weapons and tactics inserted by the exercise planners and develop solutions. When an operation begins, the Ground Forces Command opens a “war time learning center” that draws information from the units, processes it, and sends the new discoveries and techno-tactical solutions back to the units within 24 hours.

Training commanders in this learning mechanism has admittedly been uneven in terms of its effectiveness in recent years, but is an ongoing effort.

### *Organizational Changes that Push Knowledge Development*

Some of the challenges that the IDF experienced in recent years either stem from or supposedly should be overcome by emerging capabilities, which must be explored in order to be better understood before their full exploitation. Therefore, some of the organizational changes in recent years have had an exploratory character. Then-Chief of Staff Benny Gantz established the Depth Command in 2012, and his successor Gadi Eizenkot established the Commando Brigade in 2016. Both organizations were tasked with developing concepts and



The IDF's paratroopers brigade operate within the Gaza Strip to find and disable Hamas' network terror tunnels and eliminate their threat to Israeli civilians. (Israel Defense Forces, 20 July 2014)

capabilities for the employment of IDF forces in the enemy's depth, which the IDF sees as more relevant than before. Eizenkot dealt extensively with the organizational changes needed to both mitigate risks and exploit potential benefits in the cyber domain. This began in 2016 with the appointment of the first IDF Cyber Chief of Staff as a first step (within the Deputy Chief of Staff office). Discussions on the need for a cyber branch resulted in the establishment of a new Cyber Defense Division in 2018 within the newly named Communications and Cyber Branch. Offensive cyber capabilities remain within the Intelligence Directorate. The organizational journey of the IDF in the field of cyber has not yet reached its final destination.

In March 2019 Lieutenant General Aviv Kochavi, the current Chief of Staff, announced the

establishment of a new innovation and experimentation division within J5, and a "multi-domain unit" aimed at exploring new potentials for the IDF, focused on enhanced lethality against Hezbollah and Hamas.<sup>12</sup>

### **From the IDF's Experience to AI Singularity?**

The IDF's future war thinking recognizes the potential of AI for its own use, but gives relatively little attention to its exploitation by Israel's enemies, and does not deal at all with the challenge of AI singularity. Current efforts aimed at achieving the "command high ground" in all levels of war were accelerated in recent years in order to cope with the rapid changes in the Middle East on the geopolitical, strategic, operational, and tactical levels.

Still, important insights around the AI challenge can be gained from Israeli practices. First, the focus on one's own relevancy gaps may cultivate a more self-critical approach, as exemplified recently by Commandant of the U.S. Marine Corps, General David H. Berger, who issued a sweeping critique of the Marine's amphibious strategy, "calling the current approach of moving Marines ashore aboard slow, small amphibious vehicles and helicopters an 'impractical and unreasonable' plan that has been wedged within a force that 'is not organized, trained, or equipped to support the naval force' in high-end combat."<sup>13</sup> Acquiring the habit of looking for early signs of diminishing relevancy will substantially aid those who want to cope with the growing pace of changes that will surely be imposed by the introduction of AI into more and more military fields. Second, it is not known whether and how AI will replace human-based strategic and operational decision-making practices, so enhancing those that exist today will reap rewards.

There are two further recommendations regarding the rising potential of technological and doctrinal surprises based on AI. First, the broad concept of flexibility is as relevant here as it is for surprises stemming from other technological developments. Inserting surprises based on AI into training scenarios may aid not only the preparations of commanders and staffs, but also help to develop a better institutional understanding of the threat. Second, meeting the challenge of AI singularity, as with other threats, will require countermeasures. It may be worthwhile to consider developing measures to misguide enemy AI learning and decisionmaking through new kinds of deceptions and information warfare. A quick but erroneous enemy AI decision can paralyze his will to employ AI-based decision-making aid systems in the future. Developing countermeasures may prove to be easier and cheaper than developing offensive AI, as with cheap and easy-to-employ GPS jammers.

A limited "learning operation" at the beginning of a wide-scale confrontation—to assess the enemy and the situation and rapidly adjust before sending the main force—was suggested by Dado Center researchers as a lesson from IDF's engagement with the Hamas offensive tunnels in Operation "Cast Lead."<sup>14</sup> Though this recommendation was not immediately adopted by the IDF, with the high level of uncertainty in a future conflict with an enemy possessing sophisticated AI capabilities, such an approach would be essential. Even if the Dado Center proposal is not adopted per se, some kind of real-time lesson learning mechanism will be essential if the enemy employs AI in new and unforeseen ways. Adaptable organizations enable learning, unlike the pattern of traditional bureaucratic organizations that often kill new organizational initiatives in the cradle, especially in new and unfamiliar fields. This should be noted when taking first organizational steps into a potentially AI-dominated world.

## Conclusion

There is no doubt that AI will have an influence on war, and therefore on how military organizations develop in order to utilize AI and negate its use by adversaries. It may be that due to differences in military culture and norms, non-Western militaries will have fewer constraints in weaponizing and employing such emerging technologies. Rapid learning cycles, both of force design, operational concepts, and wartime lessons will be of great benefit to military organizations that want to thrive in an AI-dominated environment, especially if they lag in the introduction of AI. Although based on its unique civilian and military culture, the practices the IDF developed in recent years in the field of learning mechanisms to better engage its rapidly transforming adversaries, may aid other militaries in thinking about the necessary changes to better prepare for the day AI singularity is achieved. Some of these changes may be at the very heart of military culture. **PRISM**



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## Notes

<sup>1</sup>Elsa B. Kania, *Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power*. November 2017. Center for a New American Security.

<sup>2</sup>Named after the ninth chief of staff of the IDF David Elazar (nicknamed Dado), who commanded the IDF in the Yom Kippur War.

<sup>3</sup>This idea (and term) was developed by Zvi Lanir, a former intelligence researcher in the intelligence directorate (Aman), who's understanding after Yom Kippur war brought him to focus on one's own conceptual and organizational faults and blocks rather than on enemy analysis.

<sup>4</sup>Headquarters, Department of the Army. ATP 5-0.1 - Army Design Methodology. July 2015. Washington, DC. The process begins with "Framing an operational environment [which] involves critical and creative thinking by a group to build models that represent the current conditions of the operational environment (current state)... (P. 1-4). "An operational environment is a composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander." (P 3-1)

<sup>5</sup>On the last one, see: Eran Ortal, 2019. "We're Confused, Too A Historical Perspective for Discussion of "Land Ahead"". *Military Review* March-April 2019: 84-98.

<sup>6</sup>It is important to note that efforts are being made, specifically under the new chief of staff, LTG Aviv Kochavi, to accelerate not only operational concept-oriented design processes, but also force design processes. The design phase of the coming IDF multiyear plan was essentially another "senior design course" for the IDF's top brass.

<sup>7</sup>Meir Finkel. 2011. *On Flexibility: Recovery from Technological and Doctrinal Surprise on the Battlefield*. Stanford University Press.

<sup>8</sup>Kania, 22-26.

<sup>9</sup>Ran Rimon, "Simulating Surprise," *Ms&T Magazine* (June 2016); Ran Rimon, "The Reflection Game," *Ms&T Magazine* (January 2018).

<sup>10</sup>Steven Mains and Gil Ad Ariely. 2009. *Learning While Fighting: Operational Knowledge Management That Makes a Difference*. *Prism 2* (s): 165-175.

<sup>11</sup>Gil Ad Ariely, "Learning While Fighting in 'Cast Lead' Operation," *Maarachot IDF Journal*, no. 425, 12-21.

<sup>12</sup>Azulai Y. (Globes). 2019a. 2019 19:11. Yuval . Israeli army chief wants to set up new innovation division. 18 March. Available from <https://en.globes.co.il/en/article-idf-seeking-to-set-up-new-innovation-division-1001278593>.

<sup>13</sup>Paul McLeary. 26 July 2019. "Sacred Cows Die As Marine Commandant Changes Course On Amphibs" breaking defence.

<sup>14</sup>Lazar Berman, Yaniv Friedman, "Perfecting the Instrument: Learning Operations at the Beginning on Campaigns," *Czech Military Review* No. 3/2018. Vol. XXVII (LIX), September 9, 2018. Based on: Meir Finkel, 2014. "Learning Operations in the beginning of war," *Ma'arachot* 457: 15-19.