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Third Offset Strategy: Army Leadership Development Implications

by

Colonel Eric J. Van Den Bosch
United States Army

Under the Direction of:
Dr. Susan Martin

United States Army War College
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Third Offset Strategy: Army Leadership Development Implications

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Abstract

The current Army Leadership Model addresses attributes and competencies of leaders that rightfully centers on human-human relationships. In 2050 and beyond, the implications of the Third Offset Strategy on the Army will challenge leaders with an operational environment transitioning to more human-machine relationships, especially with human-machine collaborative decision making and manned-unmanned teaming. Underpinned by mission command philosophy (centered on trust), leadership attributes (character, presence, intellect), and core leadership competencies (lead, develop, achieve), the Army needs to adapt leader development to enable our leaders to trust, understand, and lead increasingly capable levels of robotics and autonomous systems (RAS) - otherwise known as artificial intelligence (AI).

Third Offset Strategy: Army Leadership Development Implications

> We have to place the big bets…, every assumption we hold…must be challenged. War, war tends to slaughter the sacred cows of tradition…. Those of us… that stubbornly cling to the past will lose… in a big way.
>
> —General Mark A. Milley[1]

Do you trust me? This is an odd question to be posed at the beginning of a research paper, but did you cling to your past and assume it was asked by a human? The relationship between humans and artificial intelligence systems in the future will challenge our traditions and our assumptions as we enter the operational environment of the Third Offset Strategy. The Army leadership development program must take into account human-machine trust relationships evolving within this environment. In 2016, General Milley emphasized that future leader traits include taking risks where "[crises] will unfold rapidly, compressing decision cycles and response times"[2] and where ambiguous actors leverage information warfare to confuse situational understanding. Looking toward 2050, technology will create dynamic human-machine relationships that contain leadership challenges, including compressed decision and action cycles, which can become game-changing opportunities for those that can exploit them.

The Department of Defense (DoD) is pursuing a Third Offset Strategy centered on innovative technologies combined with innovative operations, organization, and talent management. Human-machine interaction will transform from merely achieving a relatively superior 'physical power' relationship from the past to achieving a relatively superior 'cognitive power' relationship to enable us to recognize, decide, and act before the adversary. Technology alone is not the offset strategy, but rather leveraging technology across warfighting capabilities with new operational and organization constructs for our people - our strength - to exploit opportunities in multi-domain battle.[3]

The current Army Leadership Model addresses attributes and competencies of leaders that rightfully centers on human-human relationships.[4] For 2050 and beyond, the implications of the Third Offset Strategy on the Army will challenge leaders with an operational environment transitioning to more human-machine relationships. The Army needs to adapt leader and team development, underpinned by mission command philosophy (centered on trust), leadership attributes (character, presence, intellect), and core leadership competencies (lead, develop, achieve), to enable our leaders to aptly trust, understand, and lead increasingly capable levels within a broad category of artificial intelligence. This aligns with several Army Warfighting Challenges (AWfC): 1-Situational Understanding; 9- Improve Soldier, Leader, and Team Performance; 10-Develop Agile and Adaptive Leaders; and, 19-Exercise Mission Command.

The Army needs to train and develop leaders to maximize human-machine effectiveness by leveraging artificial intelligence capabilities for collaborative decision making and manned-unmanned teaming in the multi-domain operational environment in the year 2050 and beyond. This paper will address the expected autonomous capability maturity levels and changes in leader decision making and team development when relying relatively more on machines. Focused on elements of trusting and influencing machines, it will present implications and present opportunities for future leadership development to reduce barriers and maximize effectiveness of our leaders in 2050 and beyond.

Vision of the Future

The vision of the United States' future Army is nested within the Department of Defense's Third Offset world looking at the year 2050 and beyond. The Secretary of Defense's (SecDef) vision of the Third Offset Strategy has material technological capabilities that include: Autonomous Learning Systems; Human-Machine Collaborative Decision Making; Assisted Human Operations; Advanced Manned-Unmanned System Operations; and, Autonomous and High-Speed Weapons. Technology alone is not the offset strategy, but requires new operational and organizational constructs for the DoD to wage Multi-Domain Battle and get inside the adversary decision cycle.[5]

The U.S. will be challenged by a global military peer power where all domains (land, air, maritime, space, and cyberspace) are contested. The speed of recognition, speed of decision, and speed of action will strain human abilities, so more human tasks will be aided by autonomous systems enabling human-machine teams to decide and act faster.[6] The Army Chief Information Officer/G6 (CIO/G6), in the “Shaping the Army Network: 2025-2040” strategy, envisions that “augmented humans, autonomous processes and automated decision making, will permeate the battlefield. The speed at which data is dispersed will create an information-rich environment [where] extraction of mission-relevant content may be challenging.”[7] The Army’s Robotics and Autonomous Systems Strategy offers that autonomous systems will be fully integrated into the force where leaders can focus on the mission without direct manipulation to control these systems.[8] Use of these systems will require changes in how we manage knowledge, highlighted by Army Warfighting Challenge (AWfC) 19, “Execute Mission Command: How to understand, visualize, describe, and direct operations … to seize the initiative over the enemy.”[9] Autonomous systems will enable Mission Command by turning immense amounts of data into relevant, structured elements to aid in making decisions. Humans are critical in this complex system; human systems integration is an approach that specifies explicit tradeoffs to optimize system performance to leverage human strengths and autonomous systems strengths, vice being solely material solution centric.[10]

Possible Implications

The intent of this paper is to prompt dialogue on the possible implications requiring the Army to make adjustments early enough to be able to fully leverage the competitive advantage of the DoD's Third Offset Strategy:

- Are there unique aspects to developing leaders in the environment of the Third Offset Strategy, specifically for leveraging a level of artificial intelligence (autonomous systems) within human-machine collaborative decision making?
- Is there a difference in how U.S. Army leaders view use of autonomous systems compared with other countries and cultures? If so, what are the implications of that differential?
- Is the U.S. Army currently developing leaders with the attributes and competencies to take advantage of increases in maturity of autonomous systems? If not, does it have a plan that adapts with the increase in maturity of autonomous systems over time?
- What are the implications of maintaining the current Army Leadership Development Model with the projected technological, organizational, and operational changes of the Third Offset Strategy?

Scope

Within the Third Offset Strategy, the scope of this paper is narrowed to focus primarily on Human-Machine Collaborative Decision Making capabilities. This relationship leverages aspects of artificial intelligence in a functional autonomous range.

The functions will also include Advanced Manned-Unmanned System Operations and Autonomous Weapons, but will center on Human-Machine Collaborative Decision Making capabilities. As with any vision of the future, definitions and assumptions are needed to clarify the level of technical maturity expected in 2050 and beyond.

Artificial Intelligence Definitions

Some definitions are required to understand the differences in artificial intelligence, automation, and autonomy to determine the scope. Overall, *AI* is the "capability of computer systems to perform tasks that normally require human intelligence such as perception, conversation, and decision-making."[11] Within AI, *automation* is the "level of human intervention required by a system to execute a given task(s) in a given environment. The highest level of automation is having no immediate human intervention."[12] *Autonomy*, different from automation, is the "level of independence that humans grant a system… to achieve an assigned mission [with]…planning, and decision-making."[13] The variation across the autonomy spectrum will be tailored to a specific mission, level of acceptable risk, and degree of human-machine teaming.

Defining the Capability Maturity Level

There is no on-off aspect of artificial intelligence. In theory, there is a spectrum that ranges from no machines, to simple 'automation', to more complex but narrowly specialized 'functionally autonomous systems', and then to highly complex, adaptive systems as 'generally autonomous' or of 'the singularity', as described by author Ray Kurzweil. He expects, by the year 2045, that, "the union of human and machine, in which the knowledge and skills embedded in our brains will be combined with the vastly greater capacity, speed, and knowledge-sharing ability of our own creations."[14] Other artificial intelligence authors, like James Barrat, argue that improved intelligence augmentation is more realistic within this timeframe.[15]

Under machine level reasoning for future autonomous systems, the Defense Science Board, in their 2016 Summer Study, used the category “Think/Decide: Analysis, Reasoning, Learning.”[16] Using the Board’s guidance for long-term capabilities, we expect to see the shift from today’s high-volume computations using algorithms for rules-based decisions to a future where machines identify and eliminate irrelevant data within the context of the environment, including learning from humans. Machines will be able to use forward thinking capabilities including judgement and inference in order to apply a type of wisdom to define goals, apply intuition, and decide essential tasks – all in a sort of Commander’s Intent with Task, Purpose, and End State. We expect increased maturity in enhanced visual, verbal, and tactile (keyboard, hand gestures, etc.) human-machine inputs/outputs, vice embarking into direct mental connections (physical or radio waves to the brain) between human and machines. Today’s relatively simpler tasks, with human observation and verification, constitute a relatively small loop with the human-in-the-loop concept. We expect the long-term maturity to be more human-on-the-loop as trustworthiness of machine performance increases; for long-term maturity, we expect machines to anticipate human needs as leaders learn to use shared mental models for machines to provide cognitive and physical support faster.

A significant amount of work has been done over the years on levels of autonomy and the Army Science Board lists 11 levels of autonomy for unmanned systems from Manual Remote Control (Level 0) (full human thinking) to Autonomous

Conglomerate (Level 10) (full machine thinking). Evaluating eleven levels is beyond the scope of this paper so a simplified range of levels is shown in Figure 1 below.

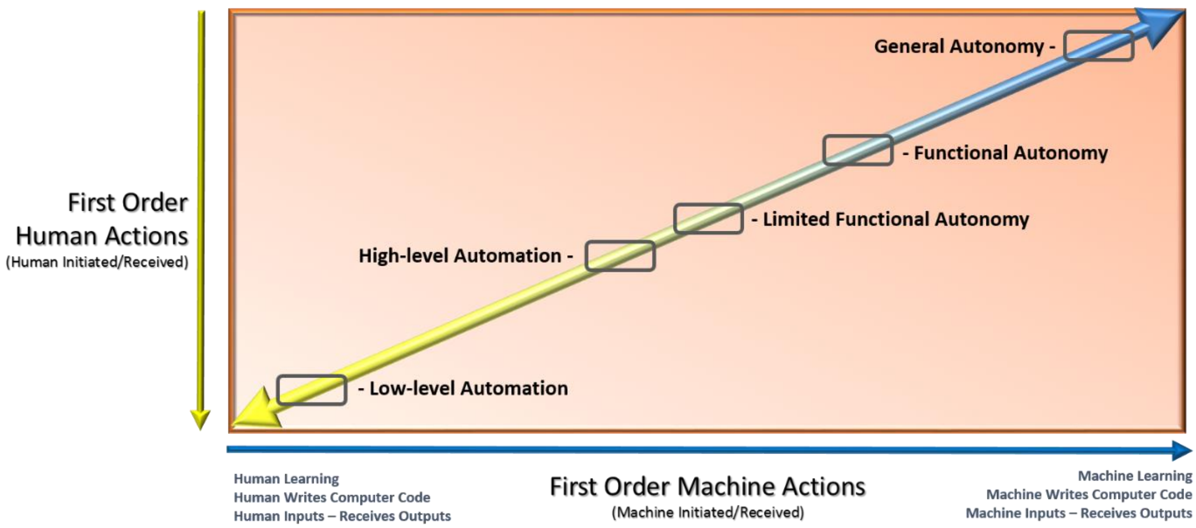

Figure 1. Automation to Autonomy Spectrum

On the left of the figure, *low-level automation* requires a relatively high amount of direct human action compared to the machine. Humans learn, they write all the computer code, and they have explicit understanding of all the inputs used to produce the outputs that they receive. Moving to the right from *low-level automation* to *high-level automation* the result is less direct human actions and more machine actions. While humans may develop all the rules-based code, *high-level automation* is such a complex system with rapid processing and vast storage that few human users understand how the results were derived. At the highest end of automation, automation may be confused with autonomy because the common user cannot determine if the machine is changing the rules in the code. The human and machine level of actions between *high-level automation* and *limited functional autonomy* may be more environmental or mission dependent, vice capability dependent. Autonomous systems mature from *limited* *functional autonomy* in the center of the figure to mature *functional autonomy* and then to *general autonomy* on the right. At the extreme right, the machine can improve itself without direct human intervention, it can modify computer code to be more efficient or effective, and it can determine which inputs are relevant or need to be added in order to produce outputs for both human and machine use. On the far right, machines have the capability to work without human intervention.

A Matter of Trust

The ability for a human to determine whether a machine is operating under its own control or human control may be a significant factor in using the technology in the first place. It may come down to whether the human leader trusts the autonomous system – the machine. A counter-argument may be that our digital natives, those that have used various levels of automation and autonomy since birth, inherently trust their autonomous systems. What if 'their' digital natives trust the capability better than 'our' digital natives? To understand this better, we will analyze personal trust, overall cultural trust, cultural trust in automation, and barriers to trust in autonomous systems. Then, the risk will be discussed in terms of which culture types may have a competitive advantage over other cultures.

Personal Trust - The 'Three Commanders' Example

An example of a range of trust in human-machine collaborative decision making can be explained by using three different Brigade Combat Team (BCT) Commanders (CDR) in the year 2050 aligned with competitors having similar autonomous systems technology where Multi-Domain Battle is extremely fast paced. Research, in human trust to complete a task with or without automation, showed that when "humans use automation/robots, the difference between their trust in automation/robots and their self-confidence in controlling the machine determines their use of automation/robots."[17] In general, we trust when we perceive a benefit from trusting compared to not trusting.[18] Again…we trust if we perceive it will result in a beneficial outcome. This has direct applications in both human-machine decision making and human-machine teaming. In the below example, a human (BCT CDR) is supported by a machine (functionally autonomous decision processing computer) with ultra-responsive recommendations based on the most current friendly, enemy, and non-combatant information for BCT CDR decision. The BCT CDR uses the machine as a cognitive aid for situational and option awareness to effectively select a recommended decision and automate distribution to all units in the BCT with updated mission orders and shared understanding.

For illustration purposes, there are three types of CDRs responding in the human-machine decision scenario. The first BCT CDR, 'No Trust', has zero trust of machine autonomous systems and low risk tolerance, therefore he/she adds additional processes to minimize failure at the expense of speed of decision and action. The second BCT CDR, 'Absolute Trust', has full and faithful trust of autonomous systems and high risk tolerance, therefore he/she maximizes the speed of decision and action enabled by autonomous systems. The third BCT CDR, 'Prudent Trust', has above average trust in use of autonomous systems with a requisite level of expertise in identifying divergent machine behaviors, therefore he/she has high speed of decision and action without disproportionately increasing operational risk. These three BCT CDRs - No Trust, Absolute Trust, and Prudent Trust – have trade-offs within the vision of the Army Operating Concept whereas the intent in the future operating environment is to present the adversary with multiple dilemmas across a multi-domain battlespace. Speed of recognition, speed of decision, and speed of action are key aspects.

In this discussion, we will assume that machines have the ability to make decisions and further, that humans have the ability to adjust the machine use of that ability based on human trust levels in the machines and leader self-confidence; whether (inter)national laws or military directives actually restrict use, the capability is available. We also assume that the general public requires human decision on kinetic lethal action. Focusing on speed of decision, if CDR No Trust requires separate human confirmation for all machine proposed decisions, then the adversary is likely to decide and act faster to the detriment of the BCT No Trust's mission; however, tactical errors are less likely to have strategic ramifications with a public that is risk averse to machines having too much leverage in lethal action decisions. If CDR Absolute Trust requires no additional human confirmation for all machine proposed decisions, then he/she is likely to decide and act faster than the adversary to the success of the BCT Absolute Trust's mission; however, there are increased possibilities of tactical errors resulting in strategic risk. If CDR Prudent Trust requires additional human confirmation only on a subset of select machine-proposed decisions, then he/she is likely to decide and act faster than the adversary in a high number of cases to the success of the majority of BCT Prudent Trust's mission objectives; so, he/she increases some tactical risk as trade-off to reduce some strategic risk based on the will of the people.

Is Trust Truly Important?

Aside from risk decisions in regards to the lethal use of force, why does the Army, the military writ large, even care about trust? Is it overrated? Stephen H.R. Covey, in "The Speed of Trust"[19] highlights the difference between high trust and low trust organizations. Organizations with high trust enable employee confidence which results in faster decisions and lower resultant costs, whereas organizations with low trust cause suspicion resulting in slower action and increased costs. Further, there are zones of trust that are based on assessment of integrity, intent, capability, and results. The zones are Blind Trust, Smart Trust, No Trust, and Distrust as per Figure 3:

Figure 2. Smart Trust™ Matrix[20]

• Zone 1: Blind Trust zone of gullibility. This is similar to the Absolute Trust BCT CDR. The Blind Trust zone is generally where the individual has a high propensity to trust and also has little ability to conduct analysis (speed or complexity may be factors). The overall result is complete dependence on machines and no real leadership.

• Zone 2: Smart Trust zone of judgment. Often thought of as leaders with good instinct and good intuition. This is similar to the Prudent Trust BCT CDR where trust is founded on a high propensity to trust, but balanced with high analysis of the other actors and the situation. There may be times where decisions are slower based on analysis and intuition, but not limited by tendencies to distrust. Overall result is higher frequency of good judgement and appropriate risk management.

• Zone 3: No Trust zone of indecision. This zone is for those who have little ability to analyze and little propensity to trust others. They do not trust themselves or others, so they are indecisive and ineffective like the No Trust BCT CDR who must do independent analysis for every machine recommendation. The overall result is decisions being made after it is too late to be effective.

• Zone 4: Distrust zone of suspicion. The No Trust BCT CDR could also fall into this zone if they have trust in themselves and are capable, but have low propensity to trust anyone else. They could be especially suspicious of machines.[21]

Further, these levels of trust can be overlaid with risk and ability to make risk decisions. Zones 1 (gullibility) and 3 (indecision) are definitely high risk. Zone 4 (suspicion) could be a low risk zone because it has a high degree of analysis; however, someone in this category would be slow in making decisions if they only rely on their own analysis. In an environment where speed is critical, this becomes high risk. The No Trust BCT CDR loses opportunities and presents longer windows of time for adversaries to exploit friendly vulnerabilities due to indecision from suspicion. Zone 2 (smart trust) is the Prudent Trust BCT CDR where risk is sensibly managed. The propensity to trust generates synergy, but not to the extent that they absolve themselves of leading.

Different cultures have different attributes that increase or decrease trust between two people – the Trustee and the Trustor. There are Trustee variables that include characteristics of motives, abilities, and behavior. The important aspect is not the absolute value of these, but rather how the Trustor perceives the value of the Trustee variables. The focus in this is the Trustor. The variable most relevant is the Trustor's propensity to trust based on biases, beliefs, and their worldview. This propensity to trust creates the lens to perceive the value of the Trustee's trustworthiness that also includes trustor-trustee relationships (peers, superior-subordinate, interdependent, e.g.) and situational variables (organization, culture, role, reputation, e.g.).[22]

Trust across Cultures

The Army is a sub-culture of the Department of Defense and likewise, the military is a sub-culture of the overall American population. Within cultures there are different levels of propensity to trust other humans. A survey in 2014 highlighted this by asking the question if "most people can be trusted" and mapped the results by country.[23] While cultures are not constrained by geographic borders and some countries have diverse subcultures, this level of abstraction enables discussion on the relevance of culture to trust. The National Military Strategy 2015 highlights several adversary/competitors to U.S. national security which include Violent Extremist Organizations (VEOs) based in the Middle East and Northern Africa (MENA), Russia, and China.

Based on the cultural level of propensity to trust from the 'Our World in Data' survey in Figure 4, the U.S. has a higher propensity to trust compared with MENA cultures (exception being Saudi Arabia) and Russia; while the U.S. has a lower propensity to trust compared with China.

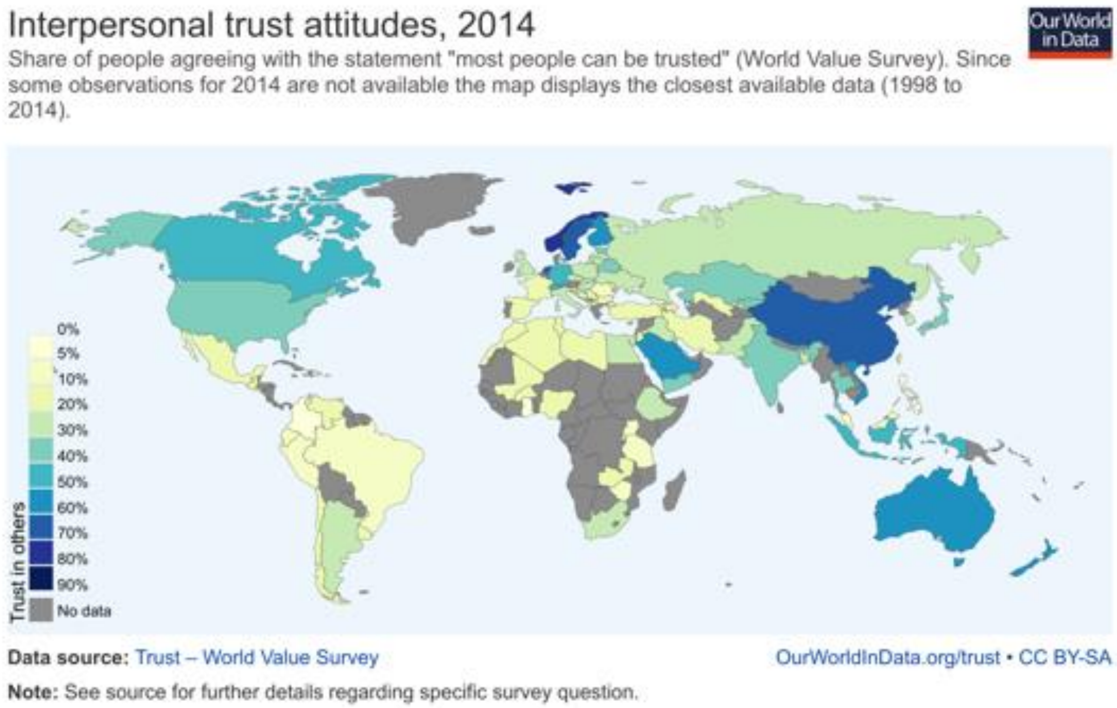

Figure 3. World Interpersonal Trust Attitudes[24]

If taken alone, this could suggest that the U.S. military has a decided competitive advantage in the trust aspect of mission command philosophy compared to MENA and Russia with a disadvantage with China. Other studies, as will be described below, have looked at East Asian cultures and found them to have strong trust for their in-group and decidedly less trust for out-groups. The follow-on question, then, is whether autonomous systems would be viewed as in-group or out-group in Chinese culture.

<u>Cultural Trust of Automation</u>

This idea of looking at interpersonal (human to human) trust across cultures was further developed to look at human trust of automation. A survey on trust of automation was conducted which found that, "early in the relationship, the trust in the system is primarily based on the predictability of the system's behavior"[25] and if "…trust decreased, the automation might be ignored or switched off and manual control became more frequent."[26] The study grouped cultures into ‘Dignity’, ‘Face’, and ‘Honor’ culture groups.

- Dignity cultures emphasized individual self-worth and are more prevalent in Western Europe and North America where laws are important aspects that govern interpersonal transactions.

- Face cultures, primarily in East Asia, centered on stable social hierarchies and norms that cherish others views of them with high trust for in-group and lower trust for out-groups.

- Honor cultures, primarily in Middle East and Latin America, have more unstable social hierarchies that require significantly longer experience to develop trust.[27]

Translating general cultural trust into trust of automation within a culture, as a precursor to trust in autonomous systems and human-machine collaborative decision making, the research suggests that Dignity cultures have the highest relative trust and Honor cultures have the lowest relative trust of automation. The study compared the U.S., Taiwan, and Turkey as representatives of the Dignity, Face, and Honor cultures. While Russia was not assessed in this study, research by renowned culture expert Geert Hofstede does include Russia and can be synthesized with this study showing Russia aligned closest to the Honor culture. In the Hofstede studies, three of the six significant indexes are Power Distance (acceptance of unequal power distribution), Uncertainty Avoidance (avoiding risk), and Individualism (embracing individualism over collectivism). Using Turkey as the pivot point on the three indexes, Russian culture is on opposing sides to the U.S. culture on all three indexes.[28] Synthesizing the two cultural studies, Russia ranks stronger as an Honor culture than Turkey in automation trust.

For the trust in automation survey, initial analysis shows a tendency for operators in Honor cultures to require longer interaction times with the automation in training and experience than operators from Dignity and Face cultures to develop an equal degree of trust in automation. The research shows that the transparency of the automation was a major factor – the operator must understand the automation systems' behavior to a certain degree to increase the propensity to trust it.[29] As seen in Figure 5, overall the U.S. (Dignity culture) had the highest score with Turkey (Honor culture) the lowest and Taiwan (Face culture) in between.[30]

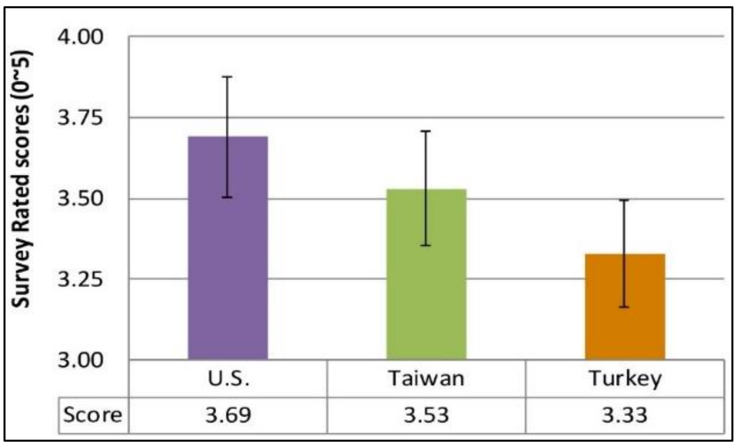

Figure 4. General Trust in Automation

Covey highlights that organizations that have high degrees of trust between entities operate more efficiently and productively, ultimately achieving their goals faster. So if we have an environment where autonomous systems are capable of fast decisions and we have an initial trust framework to evaluate how our leaders could respond, how does this framework correspond to possible adversaries based on their culture? This suggests that, at least culturally, the U.S. has an advantage in adopting automation and, by extension, autonomous systems in the human-machine relationship. This logic can be extended to Russia, as highlighted above with the Hofstede research, in that autonomous systems that have less transparency will likely have less trust by Russians. This does not mean that Russians will not adopt autonomous systems, but more likely that it will take a longer time for the preponderance of the culture to accept and utilize autonomous systems as compared with the U.S. culture. This may reveal a limited window of opportunity to exploit trust as a competitive advantage. Both cultures have military subsets to their cultures that could reduce some of the differences in overall cultural propensity to trust due to authorities directing utilization of the systems.

Barriers to Human-Machine Trust

The Defense Science Board Summer Study highlights some key aspects of trust between humans and machines that have autonomous capabilities. A summary of some of these barriers to trust include:

- Inputs. Humans have sensory functions are not easily replicated for machines. While machines have the potential for a high number of varied input types, the difference in inputs create variances in understanding the environment. Body language, verbal tone, and scents, for example, provide supplemental information during a conversation between humans beyond explicit words. Machines on the other hand could input every past conversation for immediate comparative analysis that may present a different perspective on the current conversation. Because the inputs that humans and machines receive could be significantly different, there is potential of reduced common understanding that results in lower trust.

- Processing. Even if both humans and machines receive exactly the same inputs, each may prioritize varying degrees of relevance to each of those inputs, resulting in differences in the underlying reasoning that drives a decision or action. And even if those same inputs are weighed with the same value, machine learning may lead to different results than a human with different experiences. A machine may have deeper and more rapid learning cycles within their functional area, but lack other contextual learning that humans have from more broad experiences. Machines are expected to be rational in decision making, an expected improvement over humans who may not be rational, especially in areas outside their expertise. In addition, systems validated during pre-deployment testing can quickly outgrow that initial verification once they begin adapting to the real world. Humans will need a capability to assess and audit in order to prevent, detect, and respond to divergent behavior in their autonomous support systems.

- Outputs. Ineffective conventional human-machine computer interfaces (keyboard, mouse, screen, etc.) can slow communications in situations requiring speed of recognition, decision, and action. While enhanced language processing and visual interfaces may make the experience richer, it could still paralyze the human leader with overwhelming amounts and complexity of information. Trust could deteriorate if machines cannot output their reasoning, in addition to required products, in a form consumable by humans.

On a basic level, this is no different than human to human trust. Different human leaders use different inputs, they prioritize those inputs differently based on what they learned from past experience and training (even diverging from legal and ethical norms), and they may tend to prefer certain output methods than other humans. Some humans may even be intimidated and distrusting of other humans who think differently. Human-machine trust barriers, including perceived intimidation, distrust or even resentment, have the potential to be exponentially greater as machines learn and retain information at levels that create cognitive and time availability barriers for humans to understand machine reasoning. There are great opportunities to leverage autonomous system capabilities, but also challenges of fielding capabilities to leaders who don't trust using the full capability. This could be like buying a Ferrari, but never getting it out of second gear – a lot of high-end capability only used in low-end practices.

Army Leadership Development

The Army evaluates leaders against the Leadership Requirements Model from ADRP 6-22, Leadership, and trains leaders towards the Army Leadership Development Model from the Army Leadership Development Strategy (ALDS). The requirements model highlights attributes (character, presence, intellect) and competencies (lead, develop, achieve) of leaders that can be learned, assessed, and improved.[31] The Army Leadership Development Strategy (ALDS) holds that leadership development is a competitive advantage beyond mere technology and advance weapons. Trust is foundational in the concept of mission command where adaptive leaders underwrite honest mistakes and accept prudent levels of risk by empowering subordinates with understanding, intent, and resources.[32]

To be effective in collaborating with autonomous systems, the team's effectiveness significantly relies on a human leader's trust and self-confidence in regard to autonomous systems in that human-machine relationship. The current Army leadership requirements model must be reviewed to take into account a shift to more interdependent human-machine relationships. Because leaders will adjust from leading humans to leading both humans and machines in a relationship context, four main areas are reviewed: 1) the current Army Leadership Requirements Model; 2) impacts for a future Army Leadership Requirements Model; 3) developing leaders to *trust* autonomous systems for collaborative decision making and teaming; and 4) developing leaders to *influence* machines that have autonomous capabilities.

Current Army Leadership Requirements Model

Team building is an essential task for leaders and ADRP 6-22, Leadership, highlights the team developmental steps as forming, enriching, and sustaining.[33] The current Army Leadership Requirements model contains attributes (character, presence, intellect) and competencies (lead, develop, achieve) that are impacted by the changing human-machine relationship. This model has been propagated across the Army leadership doctrine and is foundational in current officer and non-commissioned officer (NCO) evaluation support forms and evaluations. The Army has gained momentum that embedded these elements into the Army culture.

The Army Leadership publication (ADRP 6-22) specifically emphasizes that leaders need “the courage to trust.”[34] Throughout countless Army doctrinal publications, the focus is leader-centric where the *leader* must have trust and is responsible to establish trust with others. This is an absolutely valuable objective – but it is lacking in the development of trust within the center of gravity to that objective. The Army requires, but does not develop, trust in the *leader* – the *leader* is just required (even directed) to have it. Many may argue that this point is just nuanced, covered by ‘mutual-trust’, or that a leader is a follower to someone and therefore taught trust by another leader. This point is worth exploring within the context of human-machine collaborative decision making and teaming where there is significant shift in the need for the leader to trust and influence the machine to maximize opportunities within prudent risk.

Human-machine Collaborative Decision Making is much more than just a support tool in the context of autonomous decision making capability compared with just automation that presents various views of information. Today's DSSs do have increasingly mature levels of automation which have static inputs and require key human inputs and actions throughout the process. Currently, they are not autonomous systems that adjust their inputs and methodologies based on the problem, operational environment, and available resources. Human-machine collaborative decision making would likely need a shared mental model that provides a framework for human-machine interaction. However, with a functionally autonomous capability, it will be impossible for the human to understand or verify everything that led the machine to provide a specific recommendation for decision. It may be impossible to determine what inputs or events were used or decreed relevant by the machine. But similar to commander's dialogue in mission command philosophy, the expectation is that dialogue will occur between the human and machine that enables the leader, overall, to understand and visualize the computer recommendation to describe intent and direct actions. An autonomous machine will have learning capability to apply past preferences of the human leader for information presentation; similarly, the machine can highlight if the leader has established tendencies in actions that could be exploited by the adversary.

As with human-only actions, human-machine interactions include environmental complexity and mission complexity.[35] There is tremendous variability in the environment and mission factors that impact collaborative decision making and teaming missions. Agile and adaptive leaders are the start to managing that variability, but changes will be needed in our leadership development approach in the operational environment of the Third Offset Strategy to create a shared human-machine team understanding.

Impacts for Future Army Leader Requirements Model

The Army CIO/G6 is projecting its network in 2040 to be equipped with intelligent cyber physical systems (ICPS) that includes robots and autonomous systems. These ICPS will exhibit group decision making and coordinate actions autonomously. This includes a continuous evaluation of the trustworthiness of operator commands to avoid suspect orders and actions.[36] How are leaders trained to influence autonomous systems when those systems could, themselves, assess the human operator as an internal threat and possibly avoid a suspect order? After all, humans can be irrational.

While focusing on human-machine collaborative decision making using autonomous systems in a Third Offset Strategy environment, one must then, at a basic level, identify the important factors in current levels of military decision making. The Army uses decision support tools to help simplify the decision making process and has various decision support systems (DSS). Adam Larson highlights in his study, on military team decision making using DSSs, that we need to understand the complex interaction between human and machine in decision support.[37] Larson conveys the concept of 'brittleness' as questionable or low-quality courses of action and discussed how a DSS that produces brittle options for a given scenario impacts military decision making and sways humans to rely less on the automation. He also highlighted the influence of user's confidence in themselves affecting use of automation. When user trust in the automation exceeds confidence in themselves to do it better, then the machine is used. When the user does not trust the computer to perform equally or better, relative to their own ability, the user prefers to use human (manual) operation.[38]

As the Third Offset Strategy environment and mission change, the components and actions within the Leadership Requirements model need to meet the challenges of the 2050 Multi-Domain Battle environment, enabled by human-machine teaming. Some of the possible implications, addressed in Table 1, highlight impacts of human-machine collaborative decision making and manned-unmanned teaming.

Table 1. Future Implications on Leadership Attributes and Competencies[39]

	Now – 2017 No Autonomous Systems	**Possible Implications for the Future – 2050** Functional Autonomous Systems (Machines)
Leader Attributes		
Character	Human-centric	Increased Human emphasis - 'Ethical reasoning' challenged in multi-domain battle
Presence	Human-centric	Increased Human emphasis - 'Self-confidence' challenged in trust of machines
Intellect	Human-centric	Increased Machine emphasis - 'Mental ability' is a cognitive workload shift - 'Expertise' is a cognitive workload shift - 'Innovation' is a cognitive workload shift Increased Human emphasis - 'Sound judgement' challenged in trust of machines - 'Interpersonal tact' challenged in leading machines
Leader Competencies		
Leads	Human-centric	Increased Human emphasis - 'Build trust' across human-machine team Increase Human and Machine emphasis - 'Communicates' between human and machines
Develops	Human-centric	Increased Human emphasis - 'Prepare self' to trust machines - 'Develop others' adds machine learning to the team
Achieves	Human-centric	Increased Human-Machine teaming to 'get results'

The first order and definitive impact for *Leader Attributes* will be in the attribute of INTELLECT. Leaders will increasingly be expected to know how to acquire the information, as opposed to knowing the information. Machines will be a cognitive aid and importance will be placed on the leader's capacity to leverage the information processing, storage capability, and innovation capacity of the machine. The leader will see an increased level of importance within the 'sound judgment' attribute, which has the potential to be more challenging when the machine 'reasoning' may not be obvious to the human leader. Further, the ‘interpersonal tact’ attribute must address the ability to create and leverage a shared mental model that will be key in balancing machine cognitive processing with human reasoning and decisions. The ‘interpersonal tact’ attribute is about a leader knowing others perceptions, including machines in the Third Offset Strategy environment, and applying the appropriate relationship exchanges. The CHARACTER and PRESENCE attributes, in Table 1, show additional possible implications, but INTELLECT has the most significant expected challenges. *Leader Attributes* are more embedded personal traits that require more time and deliberate effort to change compared to *Leader Competencies*.

The *Leader Competencies* of LEADS, DEVELOPS, and ACHIEVES must also be reevaluated in a human-machine relationship context. The ‘communicates’ aspect of LEADS must be adapted to leverage human-machine shared mental models. It is challenging enough for our leaders in the year 2017 to understand, visualize, describe, and direct human followers in the operations process. Leaders will experience added layers of complexity as they incorporate autonomous systems into the operations process, but they also can expect huge opportunities to leverage both human and machine strengths for the team. This leader-follow model has a foundation for success because the leader often has a broad range of education and experience, even if they are not the specific expert in all areas. Assuming this same approach will be effective with human-machine relationships will likely be disappointing. Some aspects will be easier, but the Army will need to adjust their approach to account for the machine having more information processing and storage capacity.

Within the DEVELOPS competency, for example, the leader's ability and capacity to trust machines requires leaders to focus on the 'self-development' competency. They must look at methods to adjust their propensity to trust autonomous machines and their skills to interact with machines to increase their self-confidence in using the machine vice avoiding use of the machine. The research in the trust and self-confidence studies emphasized that the user's propensity to trust, as well as, a user's confidence to perform better than the machine, make a difference in the success of human-machine collaboration and teaming. Other elements of Leader Competencies, like 'develops others' and 'get results' in Table 1, can be a significant factor when the machine itself learns. The leader can drive the learning development of the machine as part of the team, but it will be different from developing human team members. These initial thoughts present the opportunity to explore the deeper implications on the future of human-machine collaboration.

Army Field Manual (FM) 6-22, Leadership Development, only states that "[p]roperly designed leader development programs develop trusted leaders of character, competence and commitment"[40] and further directs leaders to employ Army team building. While this may be perceived as a small nuance that requires no changes to the model, the implications in the environment of the Third Offset Strategy could be extremely significant. The next step is to explore developing leaders to trust and then expand to leader influence of machines.

<u>Developing Leaders to Trust Autonomous Systems</u>

The Army's Robotics and Autonomous Systems Strategy highlights that as human-machine collaboration matures, autonomous systems will contribute to faster and improved decision-making to enable leader employment of manned-unmanned formations where speed, information, and synchronization may overwhelm humans.[41] As shown in the BCT CDR example, various levels of trust in autonomous systems can make a difference in the decisions and actions of the leader. If the leader has absolute trust, there is the possibility of a gullible leader being on ‘auto-pilot’ with the machine in charge. That leader is just along for the ride and less of a leader. If a leader has no trust, there is the possibility that the leader will dismiss essential capabilities provided by the machine. In order to survive in the Multi-Domain Battle environment where speed of recognition, decision, and action are vital, a leader with no trust in machine capability will not succeed. So how does the Army develop leaders with the right amount of trust and confidence in autonomous systems and unmanned teammates to maintain the competitive advantage?

With current Army leadership development doctrine, the leader is required to build trust in their team as the emphasis of the doctrine. The focus is lacking on the leader themselves. The doctrine directs that agile and effective leaders are capable of building trust with subordinates, peers, and superiors. The leaders are responsible for their command climate and treating others with respect as contributing members of the team. The subtle aspect of the leader’s propensity to trust is mostly neglected. As autonomous systems contribute more and more to our decision making and manned-unmanned teams proliferate, the leader in those environments will have an increased burden to trust them. Finding the right education and training for our leaders to increase their trust in machines is an implication of leadership development in the Third Offset Strategy that needs to be implemented prior to arrival of the technology.

To emphasize the potential of targeting leader trust in autonomous systems beyond mere training, the earlier section on trust across cultures will be revisited. The risk matrix in Table 2 below displays the relative risk of different U.S. Army leaders who may have characteristics of different cultures compared to the adversaries they may encounter from the Dignity, Face, and Honor cultures. Revisiting the three culture types, the Dignity culture emphasized more individual self-worth where laws are important, the Face culture centered on stable social hierarchies with high trust for in-groups, and the Honor culture displayed more unstable social hierarchies requiring longer timelines to develop trust. Using that foundation, relative risk for a U.S. leader ranges from very low risk against the adversary to very high risk. While the U.S. is generally a Dignity culture, individuals within our society may display aspects of the other cultures. If a U.S. Army leader with Dignity characteristic faces another Dignity culture, like most western European North Atlantic Treaty Organization (NATO) nations, the relative risk would be medium. However, a U.S. Army leader, enabled with autonomous systems, with characteristics of an Honor culture has very high risk facing a Dignity culture adversary. A U.S. leader with less trust in autonomous systems would be at a disadvantage to an adversary that has high trust in autonomous systems.

Table 2. Relative Risk Matrix

RELATIVE RISK MATRIX[42] (Trust-Centric)	Adversary Using Autonomous System		
(U.S. Army leader's tendency applied against an adversary)	Dignity (Western European)	Face (CHINA)	Honor (RUSSIA,VEO, IRAN)
Dignity	MEDIUM	LOW	VERY LOW
Face	HIGH	MEDIUM	LOW
Honor	VERY HIGH	HIGH	MEDIUM

The Speed of Trust research, that was discussed previously, can be used as a start to the design of leadership trust within an updated leadership development strategy. While focused on human-human relationships, the research has four core elements of trust (integrity, intent, capability, and results) that are also relevant for the human-machine relationship. Looking at the leader's self-trust and relationship trust toward the machine, the first two deal with character and the last two are covered by competence.[43]

• Character. Starting with the assumption that the leader has integrity and positive intent, we look at the beliefs that the human leader has in regards to the integrity and intent of the autonomous system.

• Integrity. We may think that because machines cannot have emotions or be dishonest, integrity is not an issue; however, there must be a level of certainty in validating the integrity of the inner systems programming for the integrity element to be satisfactorily met.

• Intent. While machines may not have their own motives or agendas, the high disparity of cognitive ability between human and machine may create distrust. Leadership development will rely on methods to increase rich communication between the human-machine for the machine intent component to become transparent to the human leader.

• Competence. There is a relativity aspect between how the human views their own competence (capability and results) compared with the machines. If the human has the self-confidence that they can do a task better than the machine, they are less likely to use the machine. If the human has self-trust in their capability to control or collaborate with the autonomous system (as a cognitive aid in decision making or a physical aid in manned-unmanned teaming to achieve the desired results) AND they believe the machine has the capability and achieves results, then the perceived competence increases both self-trust and relationship trust.

Many people try to use the adoption of the automatic elevator where people initially didn't trust elevators without an operator[44] and driverless cars where people are learning to trust cars without drivers[45] as examples of trust in artificial intelligence. However, there is significant trust difference between being a rider in an automated physical device and being in an interactive relationship with a cognitive device. Taking the position that humans just need more training is an approach – but alone, it is not the optimal way ahead. The DoD Science Board emphasized that these systems must "perform effectively in their intended use and that such use will not result in high-regret, unintended consequences."[46] Trust is a foundational element in whether autonomous systems will be fully adopted. While we have to guard against over-trusting the systems, under-trusting fully capable systems will lead to lost opportunities.

Developing Leaders to Influence Autonomous Systems

This may seem simplistic, humans give orders and machines comply – correct? It will not be that simple as machines begin learning and constantly adapt to being more capable – unlike our current experiences with static automation that gives the same output for the same corresponding inputs until we deliberately change the programming code. Leaders will need a shift in mindset that a human-machine collaborative decision making capability or manned-unmanned teaming it just that – humans and machines gaining experience together. The machines will have a baseline level of autonomy and capability, but the game changer will be the learning that take place. Machines can process information and then, learn and adapt information to gain significant context to produce knowledge – but that will not happen ‘out of the box’. Today, the unmanned portion of manned-unmanned teams is just a remote controlled robot without any intelligence that gives it the functional autonomy to accomplish the mission within the leader’s constraints. The autonomous aspect of the system may have templates ‘out of the box’, but context will be added by learning the leadership style of the team leader within an environmental and mission context.

The importance of leadership influence, combined with the above section on trust, is highlighted by ADRP 6-22, Army Leadership in that “Influence depends upon relationships where leaders build positive rapport and a relationship of mutual trust, making followers more willing to support requests.”[47] How do you train a leader (squad leader to General) to influence autonomous systems? Is this simply an ‘on the job’ training event when the new technology arrives? There are at least three aspects of influencing autonomous systems that needs to be taken into account for future leader development. They include: 1) educating leaders to define and communicate behavioral constraints for machines; 2) identifying and correcting divergent machine behavior; and, 3) responding to the possibility that machines may (rightly) identify divergent (or less than optimal) human behavior – even in the leader.

- Machine Constraints. Future leader development must include the technical and social application of influencing machines with appropriate limits in order for the machine to operate freely within those bounds. Leaders must deliberately train to balance the art of maximizing the opportunities of leveraging machine speed with prudent risk reduction. Most current leadership strategies appear to rely on an end-state of having ‘agile and adaptive leaders’ and ‘mission command philosophy’. Mission Command Center of Excellence highlights ongoing Army Warfighting Challenges (AWfC) including ‘Develop Agile and Adaptive Leaders’. Much of this is focused on repetitive training and, while not incorrect, is limited to the current characteristics of warfare and not that of 2050 and beyond.

- Responding to Divergent Behavior. Leaders must be trained specifically in divergent machine behavior. The Army developed the Commander’s Risk Reduction Dashboard for the Army to determine high risk Soldiers and enable leaders to preemptively get help for Soldiers before significant negative personal or mission impacts occur. Similarly, the Army needs to develop indicators of divergent machine behavior and provide training to leaders on detecting, preventing, and responding to behavior during training and operations. This cannot be something, like cybersecurity was in the past, which is added on after we have a full deployment of robots and autonomous systems. This needs to be built into both the material systems and leader development training to be able to determine indicators and respond to autonomous systems diverging in behavior – either unpredictably or incrementally.

- Openness to Machine Advice. Humans can make poor, or even detrimental, decisions based on cognitive biases and stressors resulting from physical, mental, emotional, and spiritual factors. In a human-machine collaborative decision making context, the machine may have the ability to determine, and even question, when a human leader presents a clearly ‘wrong’ decision or order. What if the order is just less than optimal? Leaders will need to be trained on influencing the machine to understand an order that may be less than perfect, but based on other values. Per the opening assumption, human-machine collaborative decision making is not just automation that takes multiple inputs and provides methodical outputs. The power of machine learning and collaborative decision making is being adaptive to the speed of the future operational environment. In that machine learning, especially after countless iterations of training with multiple leaders and sharing across other similar platforms that trained with multiple leaders, the machine has the potential to question human decisions. And likely, the machine will be right. But our leaders must be trained to influence the machine. Similar to human to human interactions toward influencing subordinates, peers and superiors, leaders must be developed to influence machines when the machine calculation is unexpected or appears suboptimal, but the leader still makes the decision to proceed. And leaders must be developed to be open to possibility that the machine may be right. Depending on propensity to trust, some leaders may not accept being questioned by a machine.

During this development, there may be opportunity to utilize influence methods from Army Leadership (ADRP 6-22) doctrine for humans influencing machines. These include methods of *pressure* and *legitimizing,* where an order could be coded as a leader-follower rule, which may easily translate to influence machines. Others, like *exchange, personal appeals,* and *apprising* would be less viable toward machines. And then *collaboration* and *rational persuasion* may be the best fit in 2050 to enable the best of machine speed and human values.[48] In general, emotional pleas will be less effective than direct or rational influence methods.

Leaders need to have some amount of expertise in understanding the machine's thinking processes to prudently recognize divergent behavior. The Army autonomous systems strategy highlights machines reducing our cognitive loads – basically making the vast amount of information consumable where relevant – and increasingly taking on irrelevant tasks from humans. Air traffic controller studies present an example of human-machine interaction when automation capabilities were increased in processing flight path deconfliction and airport activities. The human controller was set up to supervise the automation and resolve conflicts that the automation flags; they had a spectrum of options depending on their trust in the automation and confidence in themselves. The options included, for example, the ability to manually over-ride automation system guidance for specified aircraft and to choose the type of maneuver to resolve an air space conflict including route or altitude changes. The studies showed that the automated controller increasingly tended to issue route clearances vice altitude clearance changes. Distinctly different, it emerged in the study that humans traditionally preferred altitude clearance changes because the changes were simpler to give verbally to one aircraft even if it required a follow on change to return the aircraft to the original altitude. The automation preferred to give route clearance changes that require more calculations but required only one order via data transmission to both aircraft and no follow up. Both solutions worked. The point is that human-machine teaming may involve situations where both the human and the machine may each have a perfectly viable solution, but each have a tendency to decide or execute differently – a human may trust one traditional approach more while the machine may execute a more efficient approach. Trust could break down within the team if the human leader is not trained to influence the automation resulting in “disruptive interactions and ineffective team work between the human controller and the automation.”[49]

Conclusion - Opportunities and Challenges

The Army has an opportunity to seize the initiative ahead of our peer competitors. The Army’s culture of trust and world-class leadership development is an advantage that can be maintained within organizational and operational constructs leveraging future autonomous systems. To address the implications on Army leadership development in the environment of the Third Offset Strategy, the Army can start with the following five overall areas: 1) replicating human-human dialogue capabilities in human-machine interface; 2) updating the Leadership Development Model; 3) developing human-machine trust in leaders; 4) developing leadership influence of machines; and, 5) developing autonomous systems certification and auditing authorities. The Army can link these into essential elements analysis of the following AWfCs: 1 - Situational Understanding; 9 - Improve Soldier, Leader, and Team Performance; 10 - Develop Agile and Adaptive Leaders; and, 19 – Execute Mission Command.

Human-Machine Interface

Collaborative decision making requires human-machine interfaces that enables commander’s dialogue, as outlined in ADRP 6-0, Mission Command and ADRP 5-0, The Operations Process, to take place. This must address replication of human-human dialogue capabilities and enhanced human-machine interfaces that create a rich information experience without cognitive overload. That interface must be verbal in order to question and receive various level of abstraction in review of the courses of action and recommended decision in combination with visual outputs.

Update the Leadership Requirements Model

The Army must proactively develop an update to the Leadership Requirements Model. Rather than training and education taking place after the technology arrives, the Army can plan ahead to develop leaders against an updated model that accounts for human-machine teaming. While attributes and competencies at the top level may remain the same, leaders need time to train on the underlying elements to be prepared for collaboration with autonomous systems when they arrive.

Leadership Trust in Autonomous Systems

The Army must develop doctrine and training that addresses developing trust in leaders, as opposed to the current model of educating leaders on trust concepts and then directing leaders to develop trust within their subordinates through examples such as command climate, counseling, and unit training. While leader-follow trust is important, a machine does not necessarily need to trust a human. It is possible that the machine will adapt its recommendations (human-machine collaborative decision making) and actions (manned-unmanned teaming) to less creative or optimal options if human responses repetitively narrow the risk. The machine may learn to preemptively reduce the risk based on a leader's trust patterns, resulting in lower risk and also fewer available options as high-risk, high-reward opportunities. The Army has a rotational assignment standard where key leaders rarely remain in a position longer than two years. A newly assigned leader may need to understand the tendencies that the machine learned based on trust and risk acceptance patterns of previous leaders. Alternatively, or in addition, the Army could require the system to upload the leader's profile in order to quickly adapt to the new leader's trust and risk acceptance levels.

Because most Army education, training, and doctrine is centered on Leader-Follower trust relationships as opposed to Leader-Advisor trust relationships, we need to adapt training to address both the belief component (trustworthiness of the machine) and the behavior component (capability and intention to take action). We cannot direct Army leaders to 'just trust the machines', but rather need to develop screening during recruitment and opportunities to develop interactive trust between human-machine counterparts. Because propensity to trust is likely a stable trait once adulthood is reached, screening is needed to filter those with a significantly low propensity to trust.[50]

Training can be developed using an increasing scale of trust ranging from low-trust/slow-decision to high-trust/fast-decision as the human leader increases their perspective of the trustworthiness of the machine and their self-confidence. The argument could be made that this recommendation is nothing more than the standard crawl, walk, run model to move from *untrained* (U) to *fully trained* (T) per FM 7-0, Train in a Complex World.[51] That argument implies that interactive human leader and autonomous system teaming just requires more practice in increasingly complex scenarios to become proficient. Because this has a significant cognitive element, as opposed to primarily physical, the counterpoint is that the functional autonomous systems for decision making creates a human and machine interdependent relationship.

Trust evolves by being vulnerable to another so the training needs to be developed towards human leaders recognizing the capabilities that the autonomous systems can best perform compared to the human. The richness of the human-machine interface (dialogue, hand gestures, virtual reality/hologram, 3D screens, etc.) will be key in this endeavor. The machine must engage in meaningful dialogue, beyond mere voice recognition skills, to increase confidence in leaders to trust their recommendations. The machine must be able to tailor COAs to various levels of abstraction – basically, it must have the ability to provide COA recommendations very simply or very detailed depending on the human leader dialogue style. It must be a setting or a dial that is verbally, or otherwise, adjusted in a dynamic way so that the leader can ask for high level abstraction of the COA options and recommendations with asking for more detailed explanations to follow up. The machine must have the capability to convey reasoning at various levels of detail in order to provide the human confidence on the recommendations and also resolve any possible cognitive biases that the machine may have obtained through programing or machine learning.

Leadership Influence of Autonomous Systems

The Army should consider developing a collaborative decision-making cohort program where officers in the basic course are provided an out-of-the-box, basic level decision-making autonomous system. The machine may only start with a high school level of knowledge and will learn with the assigned junior leader during their education, their follow-on assignment for training, and even their self-development experiences. Periodic programmatic reviews would check progress with a detailed analysis during their captains' career course of the combined human-machine progress in knowledge and decision making. The benefit is two-fold - screen out those without the propensity to trust and also develop junior leaders to trust and influence machine learning behavior.

Certified Autonomous Systems

The DoD can establish a type of industry or DoD credentialing standard for autonomous systems which can enable individuals to trust the qualification of other team members, in this case, the autonomous system. Similar to a medical doctor having a medical license or a police officer having a badge, these credentials increase the human propensity to trust the machine within its domain of expertise. If a system is approved by an ‘autonomous systems certification authority’ verifying that the system meets performance and ethics standards (for example), then there is a degree of authority-based trust that accelerates the level of performance in the human-machine team. The Defense Science Board Summer Study highlights that the systems development lifecycle needs to calibrate trust in autonomous systems as an ongoing process. Trust will mature as military operators are more familiar with training and operating with these systems.[52] Initial certification and recurring audits can help develop a baseline of trust and verify operation within allowable parameters after deployment of the machine into the operating environment.

In closing, preaching today’s mantra of a vision of agile and adaptive leaders, and mission command philosophy, is not good enough for tomorrow – it only superficially addresses the challenges of the rising velocity of decision and action cycles requiring machine collaboration. Standardized, cookie-cutter training alone will be insufficient. The Army must take into account trust variables for the leader-machine developmental process that includes personal and cultural aspects. Further, training the U.S. Army will not be the same as our mission partners who have significant cultural differences in respect to trust and experience with autonomous systems. Experience, while significantly important, can reinforce work arounds, especially during critical periods of transitioning to the next technology. Leveraging the Army Leadership Development Strategy and Leadership Requirements Model, the Army must make updates to compensate for a leader's propensity to trust and influence autonomous systems.

Evangelizing today's mission command and mutual trust concepts across the multi-domain team will significantly fall short in a future if humans methodically slow down autonomous systems that attempt to operate at machine-speed. Current AWfCs, at best, include requirements to assess robotic and human-machine team collaboration, decision making, and interface requirements, but nothing takes a deliberate approach on the development of trust and influence applications of the human-machine relationship. Humans can be extremely adaptive and also extremely rigid. Some elements of trust, between human and machine actors in the emerging artificial intelligence dynamic, may be easily strengthened with current approaches while others elements may require extensive, long-term research. Trust is enhanced by sharing interpersonal experiences, so how is that done in a human-machine relationship?

In 2050 and beyond, the implications of the Third Offset Strategy on the Army will challenge leaders with an operational environment transitioning to more human-machine relationships. Some foundational elements of the Army should not be lost, including mission command philosophy, but the Army needs to adapt leader development to enable our leaders to trust, understand, and lead increasingly capable levels of robotics and autonomous systems as a significant competitive advantage in the changing international world order. Trust me.

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