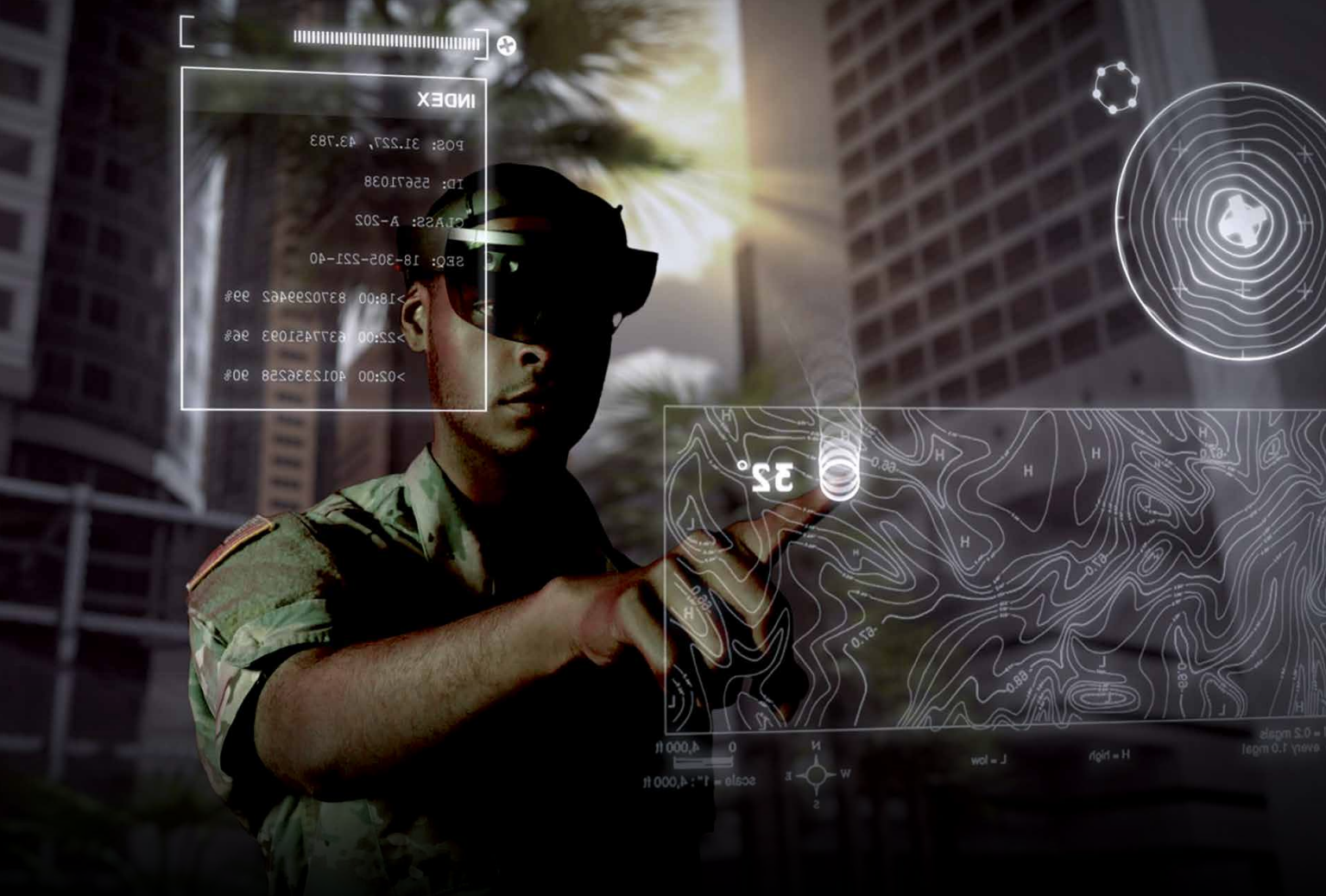

Human experience-driven mixed reality research is shaping how soldiers will operate and train. (Graphic courtesy of the U.S. Army Combat Capabilities Development Command Soldier Center)

The Fourth Domain

Lt. Col. Brian R. Hildebrand, Texas Army National Guard

Today the U.S. Army is in the midst of a digital disruption. The Army's senior leaders are fully aware of this.[1] With the establishment of the Army Futures Command in 2018 and the publication of the "Army Modernization Strategy" (AMS) in 2019, senior leaders believe shifting from an industrial age mindset to an information age mindset will help the Army get past the systemic shock of technology-induced turbulence and prepare it for multi-domain operations by 2035.[2] According to the World Economic Forum, digital technologies are contributing to a near complete overhaul of how the world operates, running the gamut from transportation and finance to communication and leadership.[3]

The broad range and scope of technology across society has had a significant impact on the Army's leader development strategy. Addressing the current state of affairs for technology, how innovation and technology are insinuated into the current leader development domains, and how a technological domain develops leaders and

what that looks like will lead to an examination on why the Army's culture needs a technological domain.

Technology in the Now

Over the last three years, the Army has consistently defined the new strategic environment as a great-power competition among geopolitical superpowers. Whereas during the wars in Afghanistan and Iraq, the U.S. Army focused mainly on violent extremist organizations, today the Army's senior leaders have shifted the focus to the peer threats of Russia and China.[4] The AMS further delineates focus areas in which Russia and China have outpaced the United States in terms of technological capabilities and establishes Army research priorities in order to make up ground.[5]

Hanging in the balance is technology's role in the Army's modernization strategy. Army leaders have a difficult task of striking the equilibrium between embracing technology as a simple solution to complex problems and applying technology as a tool.[6] Leaders intent on using technology can be lured into rushing its use with reckless abandon. How do they avoid technology's siren call?[7]

There is no question that the Army is in desperate need of modernization and that emerging technology is a central tenet in its strategy to modernize. As the Army modernizes "who we are," technology and innovation play a dominant role in leader development and education.[8] The Army needs more critical and creative leaders capable of systems thinking and who are able to streamline emerging technologies into the business of leadership and command and control of the battlefield.

Updating the Framework

The recently published Army Doctrine Publication (ADP) 6-22, *Army Leadership and the Profession,* manifests this growth.[9] It is a good mix of updates for Army leader development and a continuity of legacy concepts. The dynamics of leadership require leaders to understand in context themselves, those who they lead, and the situation.[10] Furthermore, the "Army Leader Development Strategy" is still heavily vested in the institutional Army, the operational Army, and the individual.[11] This framework enables three lines of effort of training, education, and experience.[12] Within these updates and framework, where do dynamically astute leaders sort out the most critical inputs and application of technology to leader development?

Ultimately the goal of the "Army Leader Development Strategy" is to create adaptive leaders who can exercise mission command to prevail in a complex and contested multi-domain operational environment.[13] Competence is part of the Army leadership foundation, which leads to proficiency, expertise, and mastery. ADP 6-22 defines three core leadership competencies: lead, develop, and achieve.[14] Each of these are further broken down into more competencies, ultimately making ten competencies total for Army leaders.[15] Through training, education, and experience, the Army affords leaders opportunities to develop these competencies into proficiencies.[16] These opportunities come in the form of challenging experiences.[17] Whether in the institutional, operational, or self-development domain, the challenges are laden with technology.

Institutional domain. Technology infuses training, education, and experience in the institutional domain to build a foundation for leadership capabilities. Technology enhances learning outcomes to keep apace of the emerging requirements of the multi-domain operations (MDO) environment. It does this through a variety of means: faster access to information; greater opportunity for higher levels of education through online venues; increased responsiveness through artificial intelligence; and enhanced knowledge retention, analytic reasoning, and satisfaction through virtual training simulators.[18] Ultimately, technology creates institutional agility and soldier adaptability, allows greater synergy between the various primary military education institutions and academia, and supports the fluency of technology required for implementing the "Army People Strategy."[19]

Operational domain. In the operational domain, where concepts and lessons from the institutional domain are improved upon and refined, technology is a key enabler.[20] The recursive nature of training, education, and experience in the

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Soldiers with the 730th Area Support Medical Company of the South Dakota Army National Guard conduct virtual convoy operations training 14 June 2018 during Exercise Golden Coyote at Camp Rapid, South Dakota. (Photo by Spc. Jeffery Harris, U.S. Army)

operational domain makes technology fluency a must. As leaders teach others, they learn, and they are heavily dependent on technology to do this. Training complexity runs the gamut from the simple to the complex. Sometimes it is a laptop with PowerPoint for completing Army Regulation 350-1, *Army Training and Leader Development*, training requirements; sometimes it is using Adobe Connect to host an online unit professional development program; and sometimes it is using technology to do terrain walks on virtual battlefields for reviewing case studies in tactics. In any case, technology is the main conduit for Army learning and education in the operational domain.[21]

Perhaps the best example of technology enabling, not replacing, leaders in the operational domain is the application of mission command.[22] Leaders use mission command to command and control forces both at home station and while deployed. In garrison, technology's visage takes the form of the Integrated Personnel and Pay System–Army, the Defense Readiness Reporting System–Strategic, the Defense Training Management System, and the Director's Personnel Readiness Overview. These systems of record, and myriad other semiautonomous reporting systems, give leaders at every echelon situational understanding of important key readiness indicators and help to inform decisions from the tactical to the strategic. While deployed, there are multiple technology systems used to exercise mission command. These technologies, like Force XXI Battle Command Brigade and Below and the Advanced Field Artillery Tactical Data System, are used to facilitate a common operating picture, increase situational understanding, and enhance decision-making. As the force grows and technology becomes more capable, these systems will augment more of the leader's decision-making, not taking the human element out of it but rather shaping processes and activities so that the interaction with the system is a mental, social, and physical extension of the self.[23]

Self-development domain. Where leaders encounter technology unencumbered and use it with incredible fluency is in the self-development domain. The ubiquity

of online degree programs, the emergence of handheld portable devices such as smartphones and tablets, and the ever-increasing availability of shared ideas through social media is fundamentally changing how everyone thinks, processes information, and ultimately learns.[24] Leaders across the Army have incredible access to opportunities for self-development and self-awareness. Technology helps these leaders fulfill their commitment to stay on the cutting edge of the profession.[25]

First, it increases the outlets for reading and learning. Many senior leaders in the Army publish reading lists for diverse audiences in order to encourage leaders to self-develop. Audiobooks and podcasts are another example. Those who do not like reading or lack the time and industry can learn through listening.

Next, technology cultivates the ability to conduct research through information immediacy. The internet not only allows leaders to dig deeper into the subjects they learn about through reading and experience, but it also connects them to subject-matter experts on a range of relevant topics. Technology also spurs on the capacity for continuous writing through social media platforms such as blogs, online forums, and digital media. Leaders can submit original work for publication, post ideas on a blog, and participate in professional discussion through Twitter, Facebook, or Instagram.[26]

Lastly, technology facilitates self-awareness. Online surveys and personal assessments, such as the Multisource Assessment and Feedback program, the Commander 360 program, and myriad other personal assessments, increase self-awareness for Army leaders through candid comments from subordinates, peers, and superiors. Self-awareness is further enhanced in leaders through the practices of mindfulness and meditation.[27] There are multitudes of smartphone apps for guided meditation and mindfulness, which can reposition the leader into a better posture of self-awareness.

Basically, for the self-development domain, technology translates challenges for improvement into opportunities for growth and self-awareness. The human element is not diminished by technology. Leaders still must aspire to improve and develop self-awareness; it does make satisfying these aspirations and achieving self-awareness easier.

Technology: The Fourth Domain

While technology infuses training, education, and experience in all three leader development domains, its impact is so great on the profession that it deserves consideration as a separate leadership domain with its own necessary training, education, and experiences.

> Advances in professionalism seem to be positively correlated with advances in technology and the increasing specialization they require. As technology improves, war fighting becomes more complex. With each iteration of technology—from catapults to artillery, horse-mounted cavalry to armored vehicles, sails to steam, hot air balloons to fixed-wing flight—militaries developed new core competencies. Driven by technology, these new core competencies required an equal development of technical understanding within the professional force that fields them.[28]

Making a fourth leadership development domain, specifically a technological domain, allows for the requisite development in technical understanding required of today's leaders.

What does the technological domain look like? As with the other leadership domains, it is both a reflection of society and the means by which the Army develops effective leaders for the future.[29] The ultimate goal of the technological domain is the technologically fluent leader. Taking these in short order, how does the technological domain reflect society? How does the Army use the technological domain to develop leaders? What does it look like? And what is technology fluency?

How the Fourth Domain Reflects Society

The Army has a shared identity with the society that it has sworn to protect.[30] Even though the technological domain fosters learning outcomes, developmental assignments, and self-awareness, it reflects many of the same structural changes currently underway in society. As technology redefines our current way of life, society and the Army (1) become more dependent on rapid and far-reaching technology, (2) capitalize on the globalization of information, (3) prioritize knowledge over physical attributes, and (4) flatten hierarchies.[31]

Rapid and far-reaching technology. In many ways, the Army's dependency on rapid and far-reaching technology is manifested in the way that it delivers battlefield results. The technological domain accounts for the imperative within each branch to understand the

impact of breakthrough technologies. Take, for example, the emerging tank technology of the interwar period. Two prescient and well-known Army leaders, Dwight D. Eisenhower and George S. Patton, took on the institution to bring about the tactics and techniques for armor on the battlefield. They learned a lot from their time as instructors at tank schools during World War I, presented their ideas in scholarly work during the interwar period, and then ultimately tested their theories during the series of Army maneuvers leading up to World War II.[32] Eisenhower and Patton understood the Army's dependency on new technology, and fortunately, they possessed the requisite knowledge and vision to use this technology effectively enough to prove it to the rest of the Army. This same trend is visible in today's Army senior leaders. With the publication of the AMS and the Army priority research areas, the Army at least knows what it needs to learn.[33] This is an important first step. The remainder of the equation is lining up the emerging technology leaders (ETL) to carry this technology to the battlefield. Although this remains to be seen, the global advance of technology is propelling this initiative evermore.

> "Technology … deserves consideration as a separate leadership domain with its own necessary training, education, and experiences."

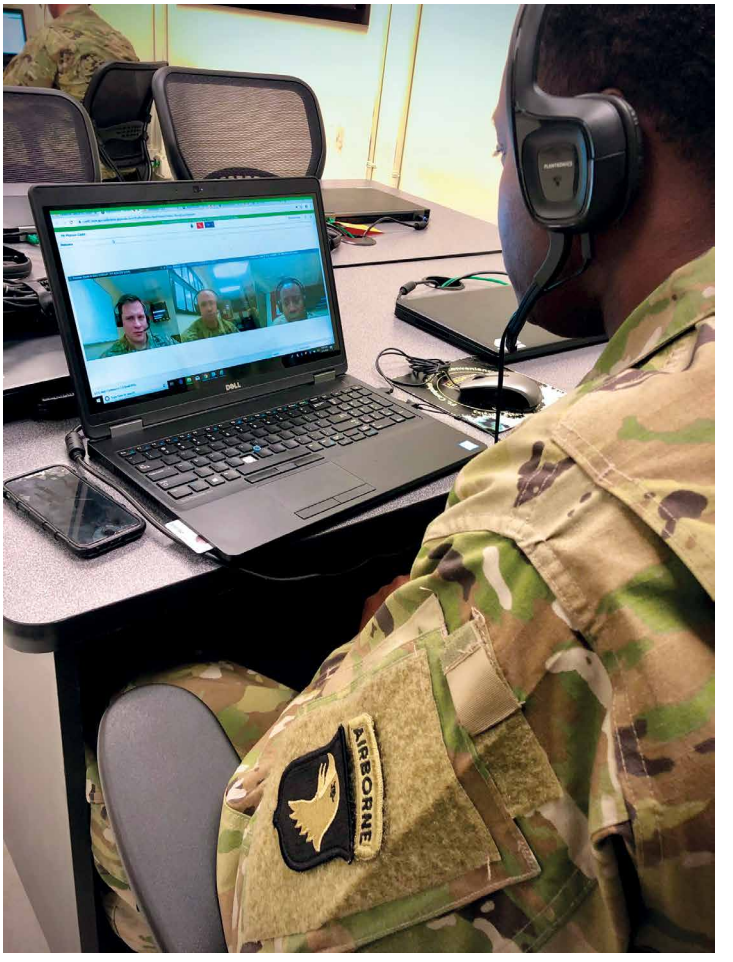
Globalization of information. Technology is not the only thing moving at breakneck speed across the world. Globalization and the internet has created an information superhighway with multiple ingresses and egresses for users everywhere. As globalization and the dynamic spread of information change how society communicates, shares ideas, and creates meaning, the technological domain accounts for the essential operational requirement within the Army to exploit information into understanding, and ultimately, action.[34] The Army has done this before but not in an all-encompassing leader development strategy such as is articulated with the fourth domain. Rather, the Army proved the importance of intelligence dominance and the ubiquity of information available during operations in Iraq and Afghanistan with Task Force (TF) 714.[35] Gen. Stanley McChrystal and his crew, including Adm. William McCraven and Lt. Gen. Michael Flynn, flipped the script on the enemy. Instead of focusing on destroying targets—people, places, and equipment—TF 714 focused on exploiting intelligence. This was a complete paradigm shift. These leaders perceived information to be the greatest common divisor on the battlefield. This drove McChrystal's decisions and allowed him to get the best possible result from the most efficient intelligence work, resulting in what Gen. Raymond Odierno called the "irreducible minimum."[36] The Army's appreciation of intelligence dominance continues even now. In today's globally connected and networked society, information looms large in every military operation. Securing the primacy of educating, training, and experiencing successful exploitation of information globalization is one of the main thrusts behind standing up the technological domain.

Primacy of knowledge over physical attributes. The discussion about the ubiquity of information segues perfectly into the conversation about the digital world, virtual world, and cyberspace. There is no denying the assertion that millions of users plug into a virtual world each day in order to be someone more or other than themselves. As society continues to shift from the physical to the virtual, the Army does the same. The implications for this transition are staggering. The Army, which is built for land warfare, may need to commit multiple resources to operate in the cyber domain. In other words, a virtual battle in cyberspace could potentially carry the same significance as a physical battle on the ground (primarily because in an MDO environment, crossover between domains is imperative for success). In this sense, the enemy is more an organism in a virtual-physical ecosystem as opposed to an organization of people and equipment. This means the Army must learn to attack not just people and machines but processes.[37] The technological domain accounts for the imperative to develop technology such as machine learning, artificial intelligence, and algorithms in order to combat these multi-domain threats.

The technological domain not only creates opportunities within each branch for leaders to learn the cutting-edge research required for this type of mission success, but it also provides the training and experience necessary for judging the operational relevance of this technology.[38]

Flattened hierarchies. A digital or networked society is a nonhierarchal, decentralized, flattened society.[39] Prima facie, this is the one area where the Army does not mirror the shift in society, as the Army is perceptibly the quintessential American hierarchy. The Army's tenacity for mission command and recent operations, such as Defender-Europe 20, suggest otherwise. The essential key to success for Allied partners participating in Defender-Europe 20 was interoperability, which is the principle of "fungibility or interchangeability of force elements and units … [and] … the mechanics of system technical capabilities and interfaces between organizations and systems."[40] In other words, despite the cultural and language differences of partners, they come together from diverse locations to achieve a mission because they share a common goal. The Army's use of mission command supports interoperability. Even though communication and information technologies improve situational understanding, the autonomy of the leader on the battlefield to accomplish the mission is the main thrust of decentralized operations and a mission command imperative. The more decentralized the organization, the better able the leader is to handle the "on demand" requirements and stay ahead of emerging threats.

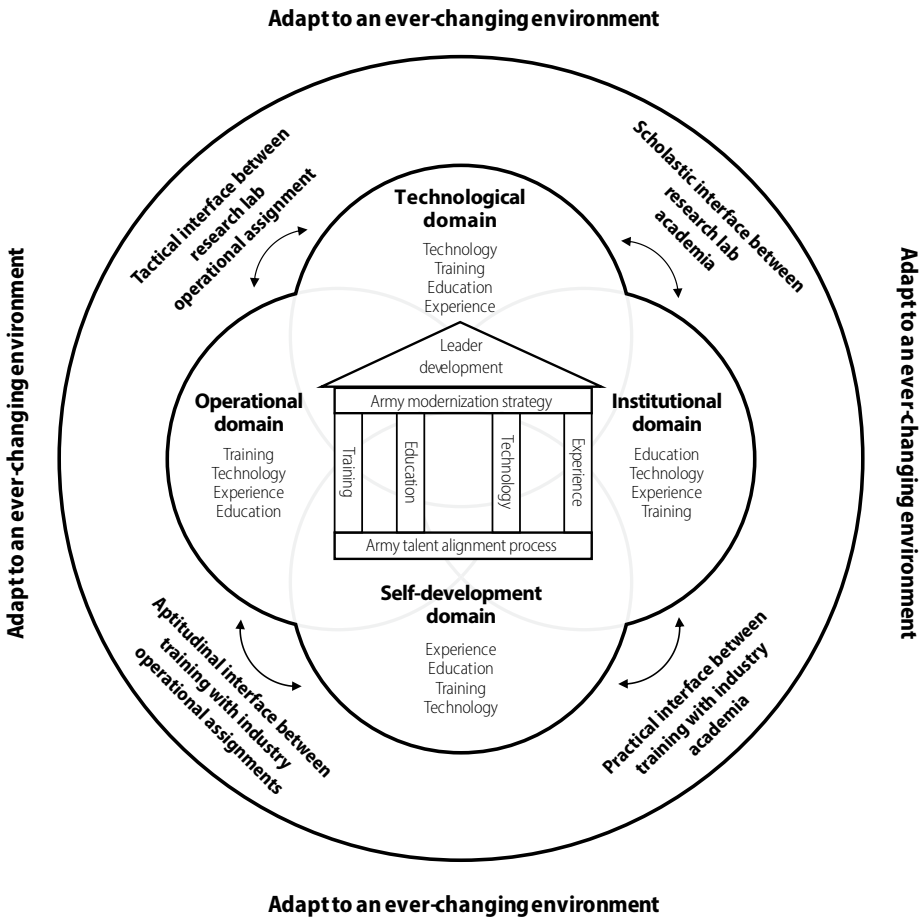
In today's world, a hierarchical organization that cannot effectively transition part of its systems to horizontal models fails because it is too slow and bureaucratic and cannot respond appropriately to the constantly changing environment. The Army flattens itself through mission command and finds the sweet spot between hierarchy and autonomy by using technology.[41] The technological domain accounts for the adaptability and nimbleness required to cope with the speed, volatility, complexity and ambiguity of an MDO environment. It does through developing leaders who can bring together all of the assets onto the battlefield despite physical locations, reduce knowledge silos and information stovepipes, and connect subordinates to resources for decentralized decision-making in the midst of high-intensity operations.



Sgt. 1st Class Jerry Dickerson, a facilitator assigned to the 101st NCO Academy at Fort Campbell, Kentucky, uses the Defense Collaboration Services website to meet with other facilitators 31 March 2020 in preparation for the daily face-to-face time between the facilitators and Basic Leader Course students at Fort Bliss, Texas. (Photo by Sgt. 1st Class Jedhel Somera, U.S. Army)

How the Technological Domain Develops Leaders

Participating in the digital and networked society not only sustains the Army's pace with social forces, ideologies, and institutions dominant within society, it also allows the Army to meet the demands of the twenty-first-century security environment.[42] The Army will do this primarily through its people and



(Figure adapted by author based on the Army Leader Development Model, *Army Leader Development Strategy 2013*)

Figure. The Fourth Domain

through its technology. The key bridge between the two is the technological domain.[43]

The Army and technology are inseparable. "The Army has been and will continue to become increasingly dependent on technology as a combat multiplier."[44] As with the other leader development domains, the technological domain develops leaders through a composite of training, education, and experience, but it does this through the lens of technology (see figure). Thus, the technological domain also develops leaders through innovation, modernization, and transformation initiatives.

Innovation. The Army has a long and storied history with innovation.[45] The defining character of successful innovations in the past has been the presence of a champion, a senior leader with a strong will and persistent personality.[46] This reinforces the core belief in the Army that its people are its greatest asset and affirms the nexus between developing leaders and innovation. The aptitude for innovation within leaders is in the bailiwick of the fourth domain. In other words, the technological domain is where leaders learn how to be agents of organizational change that helps to accomplish missions, is unique in character or application, and is underwritten by the Army at large.[47]

Modernization. Modernization builds on innovation. Focused on "how we fight, what we fight with, and who we are," the Army Modernization Framework shows how the Army will be ready for the MDO fight by 2035 despite competing priorities and reduced spending power.[48] In this sense, modernization describes ongoing processes aimed at overcoming the bureaucracies that suffocate innovation. The competitive advantage in cutting through the red tape is innovative and adaptive leaders.[49] The technological domain is the place where Army leaders learn to visualize, describe, direct, lead, and assess new ways of fighting with emerging technology and advanced equipment.

Transformation. Ultimately, innovation and modernization lead to transformation. Transformation is not a novel concept. In the last fifty years, the Army has undergone multiple transformations; one of the most important is the result of the Goldwaters-Nichols Act of 1986.[50] The Army is in the midst of another transformation. The Army is not "trying to fight the last fight better. We're focused on winning the next

Soldiers don the Integrated Visual Augmentation System (IVAS) Capability Set 2 Heads-Up Display 20 November 2019 during Soldier Touchpoint 2 testing at Fort Pickett, Virginia. The test is designed to provide feedback to Program Executive Office Soldiers so that IVAS can be further enhanced before two hundred thousand headsets begin to be fielded in 2021. (Photo by Courtney Bacon)

fight. To do that, we recognize the need for transformational change."[51] Transformation ensures that the Army moves from its current state of limited technology to a future state of unbridled innovation. Transformation also defines the ends, ways, and means for reaching this future state. The primary means for Army transformation is its people.[52] The technological domain is where innovative leaders embrace the philosophy of "people first" and where the attitude of "winning matters" meets the future operating and environment concepts and technology development required to build the Army that will fight for the next forty years.[53]

A Look inside the Technological Domain

Technical, academic research, and laboratory assignments would make up the preponderance of focus areas in the fourth domain and offer multiple ways for achieving transformational change. Leaders are ideally assigned to technological positions, upon completion of an advanced science, technology, engineering, or mathematics (STEM) degree from the civilian education system and after gaining the operational experience from a variety of challenging assignments.

Technological assignments prepare officers to integrate emerging technologies on the battlefield and better position them to advise the commander and other senior leaders in the field as to the requirements, implementation, advantages, and disadvantages of emerging technologies. Technical leaders introduce emerging technology to the unit and establish technology development programs in order to increase the knowledge of that emerging technology and its efficacy on the battlefield.

Assignment to academic research positions throughout the career time line provides technical leaders with an educational opportunity to further development or hone technical competencies through research, writing, publishing, and involvement with professional education, curriculum development, and academic instruction. Similarly, periodic assignment to laboratory positions throughout the career time line provides technical leaders with exposure to a different analytical environment.

The laboratory presents them with opportunities to work complex STEM problems and cutting-edge research. Ultimately, laboratories are where the Army grows strategic, adaptive, and innovative technical leaders

with expert capabilities in Army priority research areas: disruptive energetics, radio frequency electronic materials, quantum, hypersonic flight, artificial intelligence, autonomy synthetic biology, material by design, and science of additive manufacturing.

Fluency of Technology

While the Army envisions multiple ends for this transformational change, an investment in the Army's people is its greatest aspiration. The bottom line is that the technological domain creates leaders who are fluent in technology. To do this, the Army must expand its discourse community to include a technical vernacular. "A discourse community is a group of individuals who share a common language, common knowledge base, common thinking habits, and common intellectual assumptions."[54] True, the Army needs leaders who are fluent in technology. Even more true, however, is that the Army needs leaders who are literate in technology. The difference between technology fluency and technology literacy is mastery. Borrowing from educational technologist Clint Lalonde's idea of digital literacy and digital fluency, technological literacy is an understanding of how to use the new technologies or tools, such as any one of the emerging technologies promoted through the AMS.[55] Technology fluency is the ability to create a new process, procedure, or tactic using emerging technology. Eisenhower and Patton did this with tanks.[56] Fluency also includes "being able to move nimbly and confidently from one technology to another."[57] Thus, when the "Army People Strategy" speaks of the fluency of technology, it does so on a continuum or by degrees of mastery. At the very least, all Army leaders must be literate in technology, with the idea that they ultimately move along the continuum of proficiency to fluency.

Army Culture and the Fourth Domain

The Army is built on a culture of trust that rests on the Army values of loyalty, duty, respect, selfless service, honor, integrity, and personal courage.[58] In order for the Army to develop adaptive leaders who can compete in an MDO environment, it has to update its culture to include innovation and technology.[59] The best way to do this is through the technological domain. Here are a couple reasons why.

The technological domain connects the recent modernization initiatives like the AMS, the Army Talent Management Task Force, and the "Army People Strategy" to the core enterprise of leader development. The Army has taken an important first step in the right direction with the collaboration of the Army Talent Management Task Force to create a career field for an ETL.[60] In the past, similar programs such as the Uniformed Army Scientist and Engineer Program failed because they were too different from the mainstream Army. The Uniformed Army Scientist and Engineer Program's focus was too narrow, its skillset too unique, and its career path too divergent.[61] Additionally, it is hard for the rest of the Army to learn new techniques, tactics, and procedures or benefit from the capabilities of such a relatively small and loosely structured group of people who research and develop avant-garde projects. Small groups lack the resources to take their innovative ideas and processes enterprise wide. Having a technological domain would create the required culture necessary to sustain the career paths of the ETL, share the successes of their capabilities with the rest of the Army, scale their innovations, and really educate the force on MDO.[62]

Having a technological domain also diminishes the effects of organizational bureaucracy on innovation. The Army creates bureaucracy as a byproduct of organizational behavior and institutional processes. This happens in two ways. First, each level of the Army has its own unique bureaucracy because each level has its own understanding of how things are done and what things mean. Bureaucracy also arises during succession in senior leaders, who do not always agree on the same vision and future for the organization. As a result, desynchronization between levels of bureaucracy and succession of senior leaders typically results in frustration and innovation failure.[63] Having a technological domain, however, provides a clearinghouse for understanding the principles and practices of innovation and technology.

Technology is not a panacea. It does not supersede the primacy of mission command and human decision-making on the battlefield, and it cannot replace boots on ground during combat.[64] The technological domain puts technology in its proper place where leaders can learn how to use it to augment tactics, techniques, and procedures. The true value of technology is in how it is used, not what it can do. Having a technological domain ensures this.

Conclusion

The Army and technology have an undeniable nexus. Throughout history, technology has fueled military innovation, and it will continue to do so into the future. The Army senior leaders have the right logic. Their attempt to build a sustainable career path for the ETL signals the importance of embracing technology for the future MDO fight and sets the Army on a new trajectory. Will the career path for the ETL be sustainable? While this remains to be seen, the argument for the technological domain presents a fundamentally different approach for preparing the Army for the future MDO fight. This approach recognizes the potency of technology in leader development, engineers the framework to match skills to opportunities, and fosters an Army culture necessary to sustain the importance of technical understanding into the future. If the Army adopts a technological domain as part of the leader development strategy, it is not abandoning its old model. Rather, it is building on its existing strengths. Ultimately, adding the technological domain assimilates the core leader competencies into a consistent approach that prepares the Army for the MDO fight of the next forty years. ■

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