

Does skill, technology, or learning matter most in warfare?

Recent battlefield evidence argues that industry should rethink old weapons, invest in simulations, and emphasize corporate agility.



JAMES HASIK
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Analysis of the ongoing Russo-Ukrainian War continues to suggest answers to what matters most in warfare. With this note, I am updating an assessment I undertook in 2013, with new observations from the Russo-Ukrainian War. As my friend Byron Callan likes to say, wars are audits; and to paraphrase Leon Trotsky, from time to time, another war gets interested in us. Militaries and their supporting industries should thus always want to know what inputs best predict victory. Then, in pursuit of efficient outcomes and reasonable returns, we should ask what industrial factors matter most for supporting that victory.

Three views: skill, technology, learning.

Big questions these, worthy of some reflection. I draw on three views in addressing them.

Skill and Technology. The first holds that military quality is a function of skill and technology. That view was most notably espoused by Stephen Biddle, now of Columbia University, in his 2005 book *Military Power: Explaining Victory and Defeat in Modern Battle*. Biddle's work is methodologically intense, as he triangulates with multiple quantitative and qualitative approaches to make his point. His case selection has been generally lauded: he found battles in which, if technology were most important, victory should have gone to the other side. Lack either technology or skill, Biddle argued, and an armed force is in deep trouble. Particularly important in his view is a deep appreciation for one's own kit. Technologies are highly specific to individual forces, so training long and hard on those systems is much of what distinguishes good military organizations from bad.

Skill or Technology. Daryl Press of Dartmouth may be best known for an opposing opinion. Somewhat simplified, he found that military quality is more a function of technology or skill. His best evidence concerns the 1991 Second Persian Gulf War: he argued that the Coalition would have routed the Iraqis fighting with Soviet equipment, and even would have routed the generally incompetent Iraqis had they been fighting with the Coalition's

equipment. Chuck Yeager said something similar about his abilities with Soviet-built fighter aircraft. Press made a reasonable case that one can compensate for deficiencies in equipment by tactically playing a weak hand well.

Learning. Biddle and Press mostly analyzed skill and technology statically, in the context of individual battles. In the last fifteen years, much has been written about improving skill and technology over the course of campaigns, and between wars, through processes of military-organizational learning. John Boyd and his acolytes were beating this drum—*people, ideas, things; in that order*—for years, though without sound empirics (see my 2013 article in *Contemporary Security Policy*). We can thank John Nagl, now of the US Army War College, for resuscitating this view with his dissertation and 2005 book *Learning to Eat Soup with a Knife*, even if his underlying definitions were a bit shaky (see my 2013 article in *Defense & Security Analysis*). Regarding the aforementioned *ideas*, I. B. Holley of Duke University famously wrote of how getting doctrine wrong often means getting technology wrong. Tami Davis Biddle, now retired of the Army War College, notably wrote about how military forces can then learn the wrong things and develop yet worse doctrines if they are organizationally predisposed to dubious ideas. Since then, many people have contributed great qualitative work, studying how sundry political and organizational impediments can make learning and adaptation difficult, and what to do to overcome them (see my own 2021 book on the MRAP).

Recent evidence: answers vary over time and space.

What matters most? National styles may matter greatly. Americans love technology, and much of the Military Reform movement of the 1980s was about the argument that the Pentagon was over-investing in shiny-object new technologies at the expense of attention to training and doctrine. Answers may also differ by domain, whether one is preparing to fight on land, at sea, in the air, or in space; and whether that war is a regular or irregular affair. Consider the different lessons from the two most defining military experiences of late.

The Afghan and Iraq Wars. A decade of counterinsurgent campaigning demonstrated plenty of lessons about adaptation in technologies and skills. Bomb-proofed armor matters. Aerial surveillance matters. Electronic intelligence matters. Yet as Douglas Pryer of the US Army wrote, "Robots Don't Drink Chai," so there are only partial technological substitutes for well-trained and astute boots on the ground. Counterinsurgency is less a matter of materiel than manpower, but again, national styles interceded. Until 2007, the US Army was spending a lot more money on the Future Combat System than it was on language training and MRAPs. The US Army, the US Marine Corps, and other military forces worked hard to learn in those wars. Success varied, but most left with a better sense of what they were doing than when they started.

The Russo-Ukrainian War. More recently, eighteen months on an intensified eastern front have provided evidence for all these viewpoints. Skilled Ukrainians, constantly learning with makeshift drone technologies, have wreaked havoc on the Russian Army. Skilled Russian electronic warriors with relatively current kit have limited the power of those drones. Skilled

Russian engineers with old land mines and entrenching machines have built impressive barriers across southern Ukraine. Russian adaptation in logistics has partially compensated for Ukrainian missile attacks, if at the cost of their ability to mass against Ukrainian ground attacks.

Industry: new weapons, simulations, and agility.

So what should industry do? Industry generally provides the physical tools for equipping, and sometimes also for training the troops. These industrial tasks are strongly shaped by the military tasks that politicians devise, and the choices in materiel and personnel they make in pursuit of those. Investments choices should depend on the degree to which human or technological factors will emerge as more important in the future. I offer three possible answers:

If technology matters most, then manufacturers have strong arguments for new weapons—and new skills too. Investments in people may face technological realities that indicate diminishing marginal returns. As an analyst on the F-35 program once characterized for me the future of air-to-air combat, “everybody dies.” Fast, bloody engagements with missiles that kill from the frontal aspect at long range would eliminate aircraft and their highly trained pilots quickly. The husbanding of both air forces in the Russo-Ukrainian War may indicate that such a world is upon us, or at least that the Russians and Ukrainians believe that it is. In that case, exercises like Red Flag may matter less, whatever choices militaries make, and training more easily protected ground-based air defenders may matter more. Shifts in which technologies matter will then affect which skills matter.

If skill matters most, then the training & simulation industry has the best argument. Much of the sales *spiel* in the training and simulation (T&S) business for years has been about saving money through virtual or synthetic environments. Flying F-35s is expensive, so if that silk-scarf pilot stuff does still matter in some way, then T&S will increase in importance. Marketers in that business talk frequently about the force-multiplying effect of training more often and more realistically, which makes a strong case for more embedded T&S.

If learning matters most, then agility is an essential corporate quality for wartime contracting. As I heard a Norwegian general say recently, before 2022, “we were whispering in hallways about quadcopter with grenades”—and then suddenly they become serious anti-tank and trench-clearance weapons. Today, an industry of almost 100 firms in Ukraine is making perhaps 1000 drones daily, while the military churns through almost that number. That drone war continues to evolve rapidly, in ways reminiscent of aviation over the Western Front in the First World War.

How will we know which version of the future matters? What will be the ideal mix of human and technological factors, statically and dynamically? These are questions of technological foresight, as I discussed in my working paper of 8 June (“[On Predicting Military Innovation](#)”). Whatever the emerging realities, militaries can be slow to adapt. Probably no clean optimal balance can be drawn between investment in people and machines. Depending on the input

factors available to each military force and in each country, good solutions probably require varying approaches. But if learning is indeed most important, then **every arms manufacturer and military software developer with the financial means should have a team on the ground somewhere in Ukraine trying to learn what's being learned, and critically, how to learn.**

References and Further Reading

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