Deloitte. Insights

FEATURE

Finding the right innovation

How the military can tap into the power of architectural innovation

Joe Mariani and Isaac Jenkins

Military innovation cannot rest solely on technological advances. It is the "architecture," or how technologies are used, that helps create lasting advantage.

IT WAS ONLY 11 years from the Wright brothers' first flight at Kitty Hawk to aircraft being used by every nation in World War I (WWI). Within another year, every major power had weaponized their aircraft for both air-to-air and air-to-ground combat.[1] Similarly, the tank, which made its debut in 1915, spread to every combatant nation within about 18 months, and to every major military within a decade of WWI.[2]

From stone tools to space rockets, the march of technology is inevitable. For militaries seeking to maintain their edge, the main challenge is that technologies—sometimes even the latest-generation technologies, with decades of investment behind them—diffuse quickly from country to country. In recent years, the rise of unmanned aerial vehicles (UAVs) demonstrates just how rapidly a highly sensitive technology can move from cutting-edge to normal. In the year 2000, one single country, the United States, manufactured and used armed UAVs.[3] By 2017, at least 24 countries were manufacturing and using armed UAVs, including countries not otherwise at the technology frontier.[4] Even the most closely guarded capabilities can be replicated: Only about four years separated the first American and the first Soviet nuclear weapons tests. The end result is that if technological innovations are quickly shared by all parties, they cannot be a basis of enduring advantage over adversaries.

Tech + architecture = strategic edge

Technology may be inevitable, but luckily, new technologies are not the only form of innovation. After all, the functioning of any piece of technology is not only dependent on what it can do but also how it interacts with other technologies, processes, and even the humans that use it. The sum of those connections and interactions is called an *architecture*. While the term "architecture" can be confusing to the commercial industry, the military actually already has its own terms for the concept: *doctrine, organization, training, materiel, leadership and education, personnel, and facilities*. These are the nontechnological factors that determine how a technology gets used.

While architectures are often overlooked, their importance cannot be overstated. Just list the most impactful military innovations you can think of: the tank, aircraft carriers, precision-guided munitions. Each of these technologies only really deliver an impact with a corresponding change in doctrine or organization: blitzkrieg, the carrier battle group, maneuver warfare.

So any military that wants to use innovation to create lasting strategic advantage should not just try to find the next new technology but should also work on finding the next big architectural innovation. There is the rub. While architectures are incredibly important, they are also incredibly difficult to create because they are harder to see and therefore harder to copy.

Consider a nonmilitary example. Smartphones may be ubiquitous today, but when they debuted in 2007, the sleek touch screens and internet browsing seemed like something out of science fiction. Such thunderclap innovations may seem like the product of a moment of genius or the discovery of some new technology but in reality, almost all of the technologies in smart phones had existed for years. In fact, many came from government. GPS came from the military, lithium ion batteries from the Department of Energy, and even the touchscreen from groups such as the National Science Foundation and the Central Intelligence Agency (CIA).[5] Rather than invent any new technology, what the smartphone manufacturers did was to combine those existing technologies in a new way. They developed a new

architecture that could allow people not only to use phones to make calls but also to use the internet to do just about anything. The impact of a successful architecture can be far-ranging. Today, 78 percent of all mobile data on smartphones is not used to make phone calls at all, but to watch streaming videos, a statistic that has completely reshaped the music, television, and even publishing industries.[6]

Why are architectures hard to copy? Often because they force organizations to change the core of how they operate, elevating new players and changing the role of old ones. Despite the success of Napoleon's Grande Armée or the Prussian General Staff, other nations were slow to copy those innovations. They could see Napoleon's new artillery or Prussian breech-loading rifles and quickly copy those, but the real factors of success lay in how everything worked together, in the architecture. And when they could see glimpses of the architecture via Napoleon's meritocratic officer corps or the Prussian reserve system, domestic social, political, and economic factors limited the adversaries' ability to copy.[7] By some estimates, 90 percent of historical military innovations have been technologies aimed at doing current things better, but only 10 percent are architectural innovations that can give lasting strategic advantage.[8]

Focusing only on technology is a mistake

Given the importance of architectures, if the military only focuses on finding new technology, it will miss some of the most effective innovations. Ignoring architectures is like fighting with one hand tied behind your back.

But at the same time, the march of technological progress is inevitable. So every military faces the question: What to do with a new technology? Whenever a new technology emerges, the temptation may be to adopt that technology as fast as possible and simply stick it within existing doctrines wherever it fits.

Consider the M2 Bradley. The Bradley is an impressive piece of technology but it also has a critical weakness as an infantry fighting vehicle. The issue is that, in an effort to save costs, the Army added the same turret to both scout and infantry fighting vehicle variants of the Bradley.[9] This cut down on the interior room available, meaning that the Bradley could only hold six infantry soldiers—a problem when US Army doctrine was predicated on squads of 10 soldiers.[10] Rather than readdressing doctrine, the Army simply changed the size of the squad to fit the vehicle despite its own studies warning of decreased combat effectiveness.[11]

Emphasizing new technologies over how they enable better doctrine is a recipe for failure. However, introducing new architectures—after careful consideration and live experimentation—can help militaries adapt to new technologies and new missions, and provide innovations that can deliver lasting strategic advantage.

The ambidextrous military

So how can a military find and cultivate new architectures? That is the core challenge, because the massive importance of architectures does not mean that new technologies can simply be ignored. They remain the table stakes of innovation. The result is that modern militaries need to be ambidextrous: They need to both identify new technologies that will improve performance today while also creating the architectures that will use those technologies to give lasting strategic advantage in the future.

THE RIGHT HAND: EXPLOITING NEW TECHNOLOGIES FOR TODAY

To improve immediate performance may not require any fancy new architectures. In fact, many new technologies do not change the core of how the military operates; rather, they just introduce new capabilities or new efficiencies to do what the military does today, only better.

The good news is that most organizations are already quite good at what they do now. Instead,

their challenge is that new technologies can come from almost anywhere. So military organizations dedicated to technological innovation need to have a wide array of connections: with industry, academia, other militaries, and nontraditional technology producers such as small software firms, among others. Creating and cultivating those relationships is the full-time job of Army Futures Command, the Defense Innovation Unit, and many other organizations that do not seem to have much in common at first inspection.

THE LEFT HAND: EXPLORING NEW ARCHITECTURES FOR TOMORROW

While you can find new technologies almost anywhere, new architectures require detailed knowledge of an organization and its purpose.[12] For an area as unique as the military, this means that new architectures cannot be found externally but need to be grown from within. The challenge is that everything in an organization, from equipment to promotion structure, is built to support current architectures. New architectures by definition challenge the status quo. So, effectively changing the architectures requires much more than just revising a doctrine manual or creating a new organization chart.[13] Finding and nurturing new architectures is most effective when done through:

- **Small teams.** Small teams, often composed of junior officers with direct reporting relationships to senior leaders, can help promote new ideas against the inevitable regression to familiar ways of doing business.

  Historical example: Major Pete Ellis traveled the western Pacific alone to create the theory of offensive amphibious warfare that underpinned the island-hopping campaign of World War II.[14]

- **Live experiments.** New architectures remain just good ideas until they are proven via live experimentation with progressively larger units.

  Historical example: The sinking of the ex-German battleship *Ostrfriesland* by US aircraft in 1921 was proof of the power of air warfare.[15]

- **Institutional change.** Once proven, a new architecture must be institutionalized in different ways.

  Historical example: Naval aviation remained a curiosity until the creation of the Bureau of Aeronautics, which provided career paths, training, and opportunities for naval aviators, laying the foundation for the corps of pilots that would create carrier warfare.[16]

While these two approaches to innovation appear different, they complement each other. So, the most important question facing the military today—and the heart of military innovation—is not "where will we find more technologies like AI, hypersonics, or quantum computing" but rather "how are we going to use those technologies to do something truly new."

Endnotes

1. EyeWitness to History, "The birth of the fighter plane, 1915," accessed April 2, 2019.
2. Lieutenant colonel (P) Matthew L. Smith, "J.F.C. Fuller: His methods, insights, and vision," US Army War College, 1999.
3. Fred Kaplan, "The first drone strike," *Slate*, September 14, 2016.
4. New America, "World of drones: Examining the proliferation, development, and use of armed drones," accessed April 5, 2019.
5. Don Scott-Kemmis, "Myths, crises and complacency: Innovation policy in the United States and Australia," United States Studies Centre at the University of Sydney, December 19, 2018.
6. Business Insider Intelligence, *Mobile data will skyrocket 700 percent by 2021*, Business Insider, February 9, 2017.
7. Emily O. Goldman and Leslie C. Eliason, *The Diffusion of Military Technology and Ideas* (Stanford University Press, 2003).
8. Terry Pierce, *Warfighting and Disruptive Technologies: Disguising Innovation* (New York: Taylor and Francis Group, 2004).
9. Benjamin C. Freakley, *The Interrelationship of Weapons and Doctrine: The Case of the Bradley Fighting Vehicle* (School of Advanced Military Studies, U.S. Army Command and General Staff College, 1987).
10. Bruce Held et al., *Understanding why a ground combat vehicle that carries nine dismounts is important to the army*, RAND Corporation, accessed April 5, 2019.
11. Timothy M. Karcher, "Enhancing combat effectiveness: The evolution of the United Stated army infantry rifle squad since the end of World War II," US Army Command and General Staff College, 2002.
12. Rebecca M. Henderson and Kim B. Clark, "Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms," *Administrative Science Quarterly* 35, no. 1 (1990): pp. 9–30.
13. Clayton M. Christensen and Michael E. Raynor, *The Innovator's Solution: Creating and Sustaining Successful Growth* (Harvard Business School Press, 2003).
14. Examples from Pierce, *Warfighting and Disruptive Technologies*.
15. The forfeited German battleship was sunk by US aircraft in a test driven by Gen Billy Mitchell meant to demonstrate the combat power of aviation.
16. Examples from Pierce, *Warfighting and Disruptive Technologies.*

About the authors

JOE MARIANI is a research manager with Deloitte's Center for Integrated Research and Center for Government Insights. His research focuses on innovation and technology adoption for both commercial businesses and national security organizations. His previous experience includes work as a consultant to the defense and intelligence industries, high school science teacher, and Marine Corps intelligence officer.

ISAAC JENKINS is an expert in technology and national security. His research focuses on technology and strategy in commercial, defense, national security, and development contexts. His experience includes defense industrial policy development, work as a defense consultant, conducting research with RAND and other leading think tanks, education, and international development.

Acknowledgments

Akash Keyal from the Deloitte Center for Government Insights contributed to the research for this project, while **Aditi Rao** from Deloitte Insights contributed to the editing of the article.

About the Deloitte Center for Government Insights

The Deloitte Center for Government Insights shares inspiring stories of government innovation, looking at what's behind the adoption of new technologies and management practices. We produce cutting-edge research that guides public officials without burying them in jargon and minutiae, crystalizing essential insights in an easy-to-absorb format. Through research, forums, and immersive workshops, our goal is to provide public officials, policy professionals, and members of the media with fresh insights that advance an understanding of what is possible in government transformation.

Contacts

Terry Boyd
Managing director
US Risk and Financial Advisory
Deloitte & Touche LLP
+1 571 882 5366
tboyd@deloitte.com

William D. Eggers
Executive director
Center for Government Insights
Deloitte Services LP
+1 571 882 6586
weggers@deloitte.com

Joe Mariani
Manager
Deloitte Services LP
+1 410 576 7618
jmariani@deloitte.com

Deloitte.
Insights

Sign up for Deloitte Insights updates at www.deloitte.com/insights.

Follow @DeloitteInsight

Deloitte Insights contributors
Editorial: Aditi Rao, Blythe Hurley, Nairita Gangopadhyay, and Rupesh Bhat
Creative: Sonya Vasilieff and Mahima Dinesh
Promotion: Ankana Chakraborty
Cover artwork: Neil Webb

About Deloitte Insights

Deloitte Insights publishes original articles, reports and periodicals that provide insights for businesses, the public sector and NGOs. Our goal is to draw upon research and experience from throughout our professional services organization, and that of coauthors in academia and business, to advance the conversation on a broad spectrum of topics of interest to executives and government leaders.

Deloitte Insights is an imprint of Deloitte Development LLC.

About this publication

This publication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or its and their affiliates are, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your finances or your business. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

None of Deloitte Touche Tohmatsu Limited, its member firms, or its and their respective affiliates shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see www.deloitte.com/about to learn more about our global network of member firms.