



Calhoun: The NPS Institutional Archive
DSpace Repository

Faculty and Researchers

Faculty and Researchers' Publications

2021-01-12

Making Friends in Maker-Spaces: From Grassroots Innovation to Great-Power Competition

Blanken, Leo; Dimayuga, Romulo G. II; Tsois, Kristen

Texas National Security Review

<http://hdl.handle.net/10945/66550>

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

Downloaded from NPS Archive: Calhoun



Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

<http://www.nps.edu/library>



EDUCATING THE FORCE ABOUT
SIGN IN BECOME A MEMBER



National security.
For insiders. By insiders.



MAKING FRIENDS IN MAKER-SPACES: FROM GRASSROOTS INNOVATION TO GREAT-POWER COMPETITION

LEO BLANKEN, ROMULO G. DIMAYUGA II, AND KRISTEN
TSOLIS
COMMENTARY

JANUARY 12, 2021



When Filipino forces retook the city of Marawi from Islamic State-backed terrorists in 2017, the need for situational awareness within that urban battlespace was paramount. Marawi is composed of densely packed, multi-story buildings with extensive tunneling and bunkers that had been designed as defensive positions to secure families against the endemic clan feuding of the region. Further, the terrorists had made extensive preparations to optimize this crowded, urban landscape into a lethal operational environment. Tactical situational awareness was crucial for security forces, as a sniper or booby-trap seemed to lay around every corner.

The Islamic State fighters, through their purchase of commercial drones, however, at times had better reconnaissance capabilities than the Armed Forces of the Philippines, a key U.S. ally. In the words of one Filipino army ranger, “The Islamic State militants are better armed, with high-powered weapons, night vision goggles, the latest sniper scopes and surveillance drones.” The tactical drones necessary to provide similar awareness to Philippines troops existed but were sometimes underutilized. Fully employing these American-provided drones, such as the RQ-20 Puma, would have delivered better tactical reconnaissance for the Filipino forces, but their cost and scarcity ensured that the control of these systems was often retained at higher command levels. Further, the fear of losing such expensive equipment induced risk aversion among decision-makers and prevented them from being released for some missions, resulting in operational units often being disadvantaged against their Islamic State

opponents. A cheap, capable drone — designed to basic military specification and made widely available to tactical units — would have made the battle for Marawi much easier for Philippines security forces.

BECOME A MEMBER

As this example makes clear, U.S. partner militaries often find themselves in a “dead zone” between the high-tech systems supplied by the United States and the budgets, capacity for sustainment, and actual needs of the end-user. What is the solution? We propose marrying grassroots innovation and existing security force assistance efforts to generate solutions for partner force capability gaps. This collaboration would take place “on the ground” in the host nation. U.S. advisors would work to foster grassroots innovation alongside the partner force personnel and actors from the wider host-nation innovation ecosystem. Building on the concept of “maker-spaces” — defined as informal workshops that emphasize knowledge sharing, experimentation, and the use of technological tools that have low barriers to entry — this effort would emphasize home-grown solutions that are technologically and financially “right sized” for the host nation and the end-users.

This approach for partner force innovation has a number of attractive characteristics. First, maker-spaces are already proliferating across the U.S. military and the concept could be easily adapted to security force assistance

missions. Second, it is a solution that can fill the gap identified in the vignette above: providing tailored and sustainable solutions to partner force needs. Third, scaling this model would have nice spillover effects. It would energize the host nation's innovation base and generate opportunities for increased synchronization with other facets of U.S. foreign policy, such as economic development. Finally, as the U.S. military is desperately seeking effective lines of effort to succeed in an era of great-power competition, the maker-space model provides a cost-effective and immediately actionable tool to crowd out Chinese or Russian influence by fostering more collaborative relationships with allies and partners.

Our maker-space suggestion is just one small piece of the puzzle in fixing a much larger challenge in American national security policy: building partner force capacity. In other words, the United States wants to help generate and shape allied military capabilities that serve as a cost-effective and lower-risk alternative to the direct employment of American military force. American efforts to accomplish this goal, however, have sometimes resulted in spectacular failures. Take for example the U.S. attempt to rebuild the Iraqi military after the 2003 invasion. After providing \$10 billion in military aid from 2003 to 2014 — to include M1A1 Abrams tanks and F-16 fighters — the Islamic State forces still ran roughshod over the Iraqi military. One report offers an unequivocal summary: “In June 2014, an irregular army of lightly equipped [Islamic State] terrorists defeated the internationally supported and equipped [Iraqi Security Forces] ... The decade-long effort to create a viable Iraqi force in mirror image to the [United States] had failed.”

What does the tragic case of Iraq tell us? The U.S. military's tendency to default to organizing and equipping partner forces to look and act like American forces is often a mistake. Usually, an expensive one. Sometimes this "mirror imaging" of partner forces occurs due to simple bureaucratic inertia and mental laziness on the American side. Sometimes it is done because the partner force desires the trappings of a "modern" military for reasons of prestige or simple corruption. Whatever the reason, it often results in the equipping of partner forces with technology that is inappropriate for their needs or is too difficult to employ or sustain. A recent RAND report states,

Too often, [the] equipment provided ... is ill suited to [partner nation] forces, either because it is too sophisticated for them ... or beyond their capability (or inclination) to maintain ... [This results in the equipment being] relegated to a warehouse because of a lack of technical or maintenance capacity.

This passage describes the "dead zone" between American assistance efforts and the partner force's need for appropriate, cost-effective, and sustainable capabilities. Our maker-space model offers one possible solution.

Tailoring Assistance to Partners

Rather than simply offloading American material onto allies, new avenues could be developed to create bespoke capabilities for partner forces. Two components would be required: ingenuity and technology. The ingenuity could be provided through the innovation efforts of host-nation personnel

and enabled by American support. Adapting the current security force assistance activities of American advisors — especially special operations forces — to foster and empower partner forces would be a potent mechanism to design such tailored solutions. Further, these home-grown capabilities would establish crucial “buy in” from the end-user while also building stronger relationships with U.S. partners. The technology is also readily available. The commercial market is often leaping ahead of the defense sector in producing ready-made tools for many of the functions that smaller militaries require. From hardware to software, the private sector keeps refining, miniaturizing, and productizing the components that can be modified or repurposed for security applications.

In addition, the American military already has a model to form the nuclei of these collaborative innovation efforts: the maker-space. This “do-it-yourself” ethos has evolved from hobbyist clubs that were dedicating to building personal computers back in the 1970s, to their modern form, in which tinkerers can readily employ tools such as computer-aided design, 3D printing, computer numeric control, laser cutting, and other forms of fabrication. A crucial aspect of these spaces is the philosophy that anyone can “play” with these tools without the need for advanced technical training. Novices pool their knowledge, encourage one another, and work collaboratively to produce solutions. These spaces — also referred to as “hacker spaces,” “maker labs,” and “fab labs” — are designed to foster dynamic problem-solving through rapid prototyping and creative experimentation. The U.S. military is already embracing such maker-spaces to solve many problems at the grassroots level. The Defense Advanced

Research Projects Agency understood the potential impact of these spaces on military logistics and readiness when it funded the “MENTOR2” program to harness the know-how of military members to address in-theater fabrication. Since then, maker-spaces have been utilized on a number of military bases, on ships, in space, and at most service academies. The Marine Corps is especially interested in 3D printing to solve supply chain challenges. Military maker-spaces and rapid prototyping gear have fabricated everything from prosthetics, to rifle trigger guards, to drones, to a tool for gas turbine maintenance and, more recently, personal protective equipment to prevent coronavirus transmission.

Let’s return to the challenge faced by the Philippines armed forces and their capability gap of cheap, capable drones. Our co-author, Romulo, explored the viability of filling this gap by designing his own drone prototype in the Naval Postgraduate School’s maker-space (the “RoboDojo”) as part of his Master’s program. The resulting Force Recon Marine Company Drone (“FRC Drone”) is a micro traditional helicopter made from commercial-off-the-shelf hardware and software. The low-cost physical components and the free operating systems ensure that this drone can be produced for under \$1,000 per unit, which allows it to be built and sustained by a Philippines Force Recon Marines Company. Both the hardware and software are upgradable and replaceable, ensuring that the Force Recon Marine Company Drone is “future-proof” — able to accommodate evolving commercial technology and avoid rapid obsolescence.

Romulo’s work demonstrates the viability of designing and building a prototype to basic military specifications by a user who had no technical

expertise before entering the maker-space. He relied almost solely on open-source information, workshops hosted by the RoboDojo, and minimal funding. This experience shows that a solution to a capability gap need not be expensive and exquisite. The solution might rather be low-cost and bottom-up, as was the case here. Not only did the Force Recon Marines find a solution to their own problem, but the method of such a solution can “trickle-up” to the broader military organization by sparking wider innovation networks and activity across the Armed Forces of the Philippines.

Maker-Space and Great-Power Competition

The Defense Department faces three key challenges in working with allies and partners. First, building partner capacity is becoming even more important for American national security. Second, the United States can no longer afford to give loads of expensive military equipment to all the partner nations who it wants to influence or with whom it wants to ally. Third, there is a growing disconnect between the type of high-tech weapons and systems that are useful for the U.S. military and the lower-tech security needs of our allies and partners. Using the maker-space model to develop cost-effective, sustainable, and tailored solutions to partner force capability gaps can address each of these issues. Further, by energizing host-nation innovation ecosystems across the indigenous commercial and academic sectors it adds a “whole of government” flavor that current defense policy is sorely lacking.

By itself, this solution will not solve the problem of competing with China and Russia, and it is not intended to supplant other forms of assistance. It would, however, be a fresh vehicle to update American partnering efforts while strengthening our relationships with partner forces.

BECOME A MEMBER

Leo Blanken is an associate professor in the Defense Analysis Department at the Naval Postgraduate School, where he also serves as the deputy director of the Consortium for Robotics and Unmanned Systems Education and Research (CRUSER). He is the author of Rational Empires: Institutional Incentives and Imperial Expansion and is co-editor of Assessing War: The Challenge of Measuring Success and Failure. He also collects and DJs rare funk and soul records from the 1960s.

Maj. Romulo G. Dimayuga II is a member of the Philippine Marine Corps. He attended the Expeditionary Warfare School, Marine Corps University, Quantico, VA in 2015 and completed his Master of Science in defense analysis (irregular warfare) at the Naval Postgraduate School, Monterey, CA in 2020. His fields of specialization are Marine special operations, amphibious warfare, training and education, and intelligence.

Kristen Tsois is director of the Naval Postgraduate School campus maker-space, the "RoboDojo." She is a lecturer in the Department of Defense Analysis, teaches classes on computer network security and rapid prototyping, and is grateful to work with the amazing students at the Naval Postgraduate School.

The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of Defense or the U.S. government.

Image: U.S. Marines (Photo by Staff Sgt. T. T. Parish)

COMMENTARY

ABOUT

MEMBERS

PODCASTS

GET MORE WAR ON THE ROCKS BECOME A MEMBER

MISSION

JOIN

WOTR

SUPPORT OUR MISSION AND GET EXCLUSIVE CONTENT

PEOPLE

WARCAST

BOMBSHELL

FOLLOW US

FOUNDER'S CLUB WAR HALL

NET ASSESSMENT



CONTACT

JAW-JAW

HORNS OF A DILEMMA

NEWSLETTER

Type your email

SUBSCRIBE

SIGNING UP FOR THIS NEWSLETTER MEANS YOU AGREE TO OUR DATA POLICY

[PRIVACY POLICY](#) | [TERMS & CONDITIONS](#) | [SITEMAP](#) |

COPYRIGHT © 2019 WAR ON THE ROCKS. ALL RIGHTS RESERVED.