

SYM-AM-17-086



# Proceedings of the Fourteenth Annual Acquisition Research Symposium

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Thursday Sessions  
Volume II

**Acquisition Research:  
Creating Synergy for Informed Change**

**April 26–27, 2017**

**Published March 31, 2017**

Approved for public release; distribution is unlimited.

Prepared for the Naval Postgraduate School, Monterey, CA 93943.



Acquisition Research Program  
Graduate School of Business & Public Policy  
Naval Postgraduate School

# FAR-Based Crowd Sourcing

**Commander Zachary Staples, USN**—is the Director of the Center for Cyber Warfare at the Naval Postgraduate School (NPS) and a Military Associate Professor of Electrical and Computer Engineering at NPS, located in Monterey, CA. [zhstaple@nps.edu]

## Abstract

Looking to the past, our Navy acquisition process was organized to deliver advanced industrial hardware that has resulted in the most powerful fleet in the world. Moving forward we will still need world-leading hardware, but now and into the future warfighting capability is generated by software, perhaps more than hardware. Yet acquisition processes and timelines for the delivery of software and hardware may not necessarily be the same. This talk compares and contrasts exemplars of world-leading hardware and software companies against the pace of innovation and acquisition in the Navy, and then goes on to demonstrate a groundbreaking example of global crowdsourcing to achieve both cost and time savings on a maritime domain specific software development project.

## Talk Summary

The Chief of Naval Operations, Admiral John Richardson, uses a synonym for speed in almost every speech he gives. Whether he is emphasizing the pace of strategic change or the need for high velocity learning, there is an urgency to his message that we must think in a competitive framework and acquire the capability to fight in a more rapid and accelerated manner (Freedberg, 2017; Richardson, 2017).

As we move to a more agile acquisition mindset, it is helpful to find benchmarks for complex systems being manufactured around the globe and compare the U.S. Navy's speed of development and delivery. Interestingly, some of the most advanced commercial organizations in the world involved in producing high-tech hardware are constrained to an approximate annual model year cycle. Of note, the iPhone was introduced by Apple in 2007 and 10 years later, in 2017, they have produced only 11 distinct models (iPhone, 2017). Similarly, Tesla is often regarded as one of the most innovative and creative technology manufacturers in the world, but since their inception they have not produced vehicles faster than a model year pace (Tesla, 2017).

Thus, it is illuminating to consider that the U.S. Navy and its contractors have produced approximately two large surface combatants and two fast attack submarines per year for the past several years and are expected to continue this pace into the future (Office of the Chief of Naval Operations, 2016). Due to technology insertion programs in both the surface and submarine forces, these ships represent model year changes from year-to-year, keeping pace with the very best hardware producers in the world.

In stark contrast to the pace of high-technology hardware, leading software corporations have created development operations (dev-ops) processes that give them the capability to deliver production code multiple times per day. For example,

At Facebook, code can be released twice a day, but this is done mostly for bug fixes and internal code. New production code is released once per week: thousands of changes by hundreds of developers are packaged up by their small release team on Sundays, run through automated regression testing, and released on Tuesday if the developers who contributed the changes are present. (Bird, 2013)



Bear in mind that Facebook is delivering mission and revenue critical software upgrades and patch fixes to over a billion users around the world, and they are deploying code onto a hardware constellation that includes tens of thousands of device configurations that they have no control over. Yet, every week our handheld devices, tablets, laptops, and desktop computers run the new Facebook code with rare complications.

Similarly, the software branch at Tesla has a patch push infrastructure, and in September 2016 patched a flaw that was exposed on YouTube in one day and had updated the entire Tesla fleet of model-S vehicles in 10 days (Reuters, 2016).

In stark contrast to the world-leading commercial dev-ops capability demonstrated by Facebook and Tesla, consider the multi-year development of iterations to the AEGIS weapons system, or the much publicized “millions of lines of code” that delayed the Joint Strike Fighter for years. While the Navy is keeping pace with world-leading hardware manufacturers, our CNO calls for accelerated acquisition because we are falling years behind the pace of world-leading software firms.

If the Navy needs innovation and speed in our software acquisition, I chose to look at a few historical examples to inspire a path to change in the present. First, consider the 1927 Orteig Prize, design to be awarded to the first allied aviator to fly non-stop from New York to Paris or vice versa. When Charles Lindbergh was catapulted to fame by his successful claim on the prize, it was the culmination of a widespread investment in aviation technology that was set in motion by the drama and promise of the prize (Williams, 2015).

Similarly in 1714, the British government offered a reward to the man who could find the longitude of a location at sea. Before the discovery of a means to measure longitude, ships would drift off course or get lost at sea because they were unable to pinpoint their location relative to their east-west travel. Drawn to the incentive of a prize, clockmaker John Harrison created what is known today as the chronometer, and astronomer Tobias Mayer perfected the astronomic tables that refined the efficacy of Harrison’s machine and longitude was solved (Dunn & Twigg, n.d.).

Following in the footsteps of these grand prizes, this research sought to use a prize, awarded via a Federal Acquisition Regulation (FAR) compliant contract, to inspire speed and innovation in a Navy-specific software application.

Thankfully, in the wake of global communities brought together by the Internet there are several commercial organizations specializing in online competitions motivated by prize money. Some examples include Topcoder.com, HeroX.com, and Kaggle.com. Each of these platforms has a community with specific skills, and many individuals that form the community compete to earn prizes as their full-time employment.

An example of a software problem that my research team deals with every day has to do with creating radio frequency scenarios to stimulate a game system I deploy in the Navy hackathons I run. So we challenged the online community at Topcoder to design a user interface to solve the time lag with manually plotting vessels (Topcoder, 2016).

The crowdsourced challenge received a huge response, with 61 submissions from 17 different countries. To my knowledge this is the Navy’s first use of a globally crowdsourced online competition to develop software for a maritime task.

The Navy usually solves problems like this by hiring a vendor for a specific long-duration code development process. By using a contest to attract the help of the best software engineers in the world, I finished the hackathon with three world-class, Navy-owned designs for the price of \$12,000 dollars and created in just three days.



The contract to deliver this software was awarded to a single vendor for services and products. The services of the vendor included managing the crowdsourced development on Topcoder, translating the military requirements into a community challenge, and providing real-time management of the community's questions during the event. The deliverable products were the three designs.

After repeatedly hearing about acquisition reform but seeing limited results, it is time to accept the current acquisition system and start finding new ways to advance military software on a timeline that differs from hardware acquisition. This process should take full advantage of existing controls in the FAR, but use prize-based contests to attract the best coders and programmers in the world. It is possible to deliver world-class software at a fraction of the cost and time required from traditional defense partners, and this pathway is ready for more serious exploration on projects of greater significance than our lab tool.

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Acquisition Research Program  
Graduate School of Business & Public Policy  
Naval Postgraduate School  
555 Dyer Road, Ingersoll Hall  
Monterey, CA 93943

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