Building a Bigger Tent for Technology Innovators: The Government Is More Creative than You Think

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Executive Summary

United States national security agencies, particularly the Department of Defense, have struggled to keep up with the realities of creating and developing technology in the twenty-first century. These struggles jeopardize America's ability to deter and respond to national security threats. Moreover, the growing disconnect between national security research and development, on the one hand, and startup entrepreneurship on the other threatens the US's economic primacy. Some Pentagon officials have admitted that they do not understand how cyber security fits into the military mission, at the same time that foreign-based hackers and software developers intrude into civilian and government systems at a growing rate and damaging level. Others have acknowledged that the Defense Department's acquisition apparatus is ill-equipped to keep up with the fast pace of technology development, even if our leaders completely understood how to apply new technologies.

In order to meet these challenges, the national security establishment must engage with and use the abilities of individuals and small businesses not currently part of the national security establishment. These "nontraditional performers" are entrepreneurial, fast-moving and, in many cases, developing technologies that outperform research and products from traditional defense industry sources. Jack Welch, former CEO of General Electric once observed "when the rate of change inside an organization is less than the rate of change outside the end is in sight." He wasn't specifically taking about the national security agencies when he made that statement, but he could have been.

Engaging nontraditional performers is heavily constrained by federal contracting rules, institutional conservatism and government secrecy requirements. Each of these limits nontraditional performer engagement. Taken together, they provide an almost insurmountable challenge that many nontraditional performers are simply unwilling to attack.

U.S. national security agencies have experimented with several approaches to overcome existing constraints. For example, they have been successful with the Cyber Track Fast Track Program and their growing use of challenge prize competitions. U.S. Special Operations Command is relying on a unique program to engage nontraditional sources to develop the next generation combat suit for America's elite Special Forces units. These programs put the lie to the idea that government cannot act nimbly. Moreover, these experimental approaches have resulted in nontraditional performer engagement and advanced national security interests.

The national security agencies now have the field-tested, successful templates they need to reach nontraditional performers. The issue now is how the agencies can take their experimental

approaches and make them commonplace. The templates described in this Report show the richness of the approaches and opportunities. A growing national security crisis will occur if we do not act to apply them more effectively and broadly.

Introduction

The rarely spoken truth is that the realities of creating and developing technology under the dominant procurement model jeopardize the United States' ability to deter and respond to threats to national security. Added to that is the risk the country's economic primacy will be eroded, particularly in the area of technology leadership. Three global trends combine to create these challenges:

- The nation-state is losing its monopoly position as the organizing vehicle for human conduct. Organizations based upon local or regional force, tribalism or religious principles are eroding traditional nation-state models at an accelerating pace.

- Advanced technology is more widely available and more sophisticated than ever before. Fewer and fewer areas of technological advancement require the concentration of capital that only a large organized nation-state can provide, making damaging attacks on the U.S. by non-state actors (or failing states) more likely.

- In a growing range of conflict scenarios, the threat to use military force is not credible as a stand-alone activity.

Traditionally, national security agencies[1] have obtained innovation assistance from businesses and organizations that "know how to do business with the government." A broad range of established and well-funded programs provide billions of dollars for research and development and similarly large sums in commercial opportunities for a relatively small number of individuals, organizations and businesses. That small number comprises those that can understand – or hire someone who understands – and operate within the complex requirements of

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[1] This Report uses the term "national security agencies" to mean (i) the Department of Defense and related agencies broadly tasked with protecting the United States from traditional and nontraditional use of force (for example, the Defense Advanced Research Projects Agency, the Office of Naval Research, Air Force Office of Scientific Research and other entities related to the armed forces), (ii) the Central Intelligence Agency and agencies broadly tasked with intelligence gathering and asymmetric domestic threats (for example, the Department of Homeland Security, National Geospatial-Intelligence Agency or Defense Intelligence Agency) and (iii) other agencies that are involved with using technology to protect economic primacy (for example, the National Aeronautics and Space Administration or Department of Energy).

the Federal Acquisition Regulation and the additional rules relating to the Department of Defense, the Defense Federal Acquisition Regulations Supplement. This Report refers to these rules and regulations collectively as the "FAR."

Many observers have noted that although the FAR processes and regulations are designed to prevent fraud and abuse and to create a level playing field for participants (all of which are laudable goals), they also create lengthy timelines and increase expense and unpredictability of outcome. Increased delay, cost, and risk keep many individuals and startup businesses from even trying to work with the national security agencies. Or with the government more broadly.

This predicament has concerned some observers, since it is demonstrable that many innovators do not ever seek to work with the national security agencies. To capture the relative size of the community of small startup businesses that work with the Department of Defense for example, the following comparison is salient. Take, for example, the Department of Defense's Small Business Innovation Research Program ("SBIR Program"), the government program with the broadest reach currently being used to obtain innovation from small businesses.[2] Each year, approximately 2,000 small businesses receive funding from the SBIR Program to pursue technology and research projects. By way of comparison, each year, private investors fund 70,000 startup technology businesses, and friends and families support the creation of many more. The individuals and startup innovators that operate outside of the national security establishment compose a group that is of growing national importance. The national security establishment needs to engage with this group, referred to in this Report as "nontraditional performers," because nontraditional performers bring critical talents to the answering the changes the U.S. currently faces. Nontraditional performers can make significant contributions in many areas, including the following:

- Technology and threat identification: Nontraditional performers bring an external perspective to national security problems. Because they operate outside of the military establishment, they bring insights about what is occurring in the broader, decentralized world of technology. In a growing number of areas, the best research and solutions to national security challenges are likely to be found outside of the existing military

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[2] The SBIR and Small Business Technology Transfer ("STTR") Programs provide funding to small businesses to pursue technology research and development for a broad group of federal agencies, including the DOD. These programs are well established, and recipients of funding under these programs are not considered nontraditional performers in this Report, since the small businesses and individuals involved are already involved and engaged. However, certain aspects of this Report, particularly insights into how to motivate and engage nontraditional performers may be applicable to expanding the awareness of the SBIR and STTR programs. TandemNSI is operating a pilot program to provide mentorship and business insight to a group of SBIR and STTR funding recipients and will produce a report regarding these experiences later in 2014.

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establishment, especially in a world of straitened finances caused by budget-cutting and sequestration.

- Threat and technology response: Acculturated as they are to moving fast, making change occur, and responding to competitive threats from a multitude of directions, nontraditional performers can provide rapid and appropriate solutions to threats that are created by adversaries in a rapidly changing and decentralized world.

- Industrial primacy: National security research, development and spending is a proven driver of our national economic development. Ever since the transcontinental railroad, most industrial cycles that have driven growth and innovation owe much of their development and progress to government mentorship, facilitation and spending. Ensuring continued engagement between the national security agencies and nontraditional performers to create new businesses and adapt national security technologies to civilian use will allow the United States to create new industries and value-added employment.

Nontraditional performers are usually entrepreneurial. Entrepreneurship is fundamentally a personal behavior driven by a desire to change and influence surroundings by virtue of individual action. Entrepreneurial behavior is best characterized by the nimbleness and rapidity of innovation that is apparent in the U.S.'s deep culture of startup business formation. Entrepreneurs are not always motivated by commercial gain; rather, they are almost uniformly interested in changing the world around them and challenging existing conventions. Because independence of action is a core entrepreneurial value, they also tend to think, act and move quickly, and be willing to accept a certain degree of risk. Certainly, in the sectors of the U.S. economy where entrepreneurs have the most freedom of action, economic growth and innovation demonstrably occur.

Recognizing the valuable attributes of nontraditional performers in the changing national security environment, national security agencies have undertaken a number of new approaches to reach this group of entrepreneurs. Their activities give the lie to the all too common criticism that government and government representatives cannot be creative or act quickly. Indeed, many of these agencies' efforts reflect the commitment and vision of individuals willing to work much harder than their private industry peers and for much less than private sector pay. Changing institutional behavior is difficult under the best of circumstances, but these committed individuals are doing it.

Perhaps the largest challenge the national security establishment faces is how to change its cultural and operational attitudes to function in the twenty-first century. Traditional approaches to national security encourage and reward conservatism in many ways. The FAR reinforces these tendencies. This is not a criticism but an observation: resolving the conflict between the need for rapid and dramatic change, one the one hand, and the inherent inertia attendant on operational and organizational change, on the other, is an existential challenge.

This Report identifies a number of experimental efforts the national security agencies have used to engage with nontraditional performers. It is not intended to be an exhaustive listing. It is intended to demonstrate that the national security agencies can be creative, can think out of the box, and are committed to broadening the talent pool on which they rely. This Report is also intended to facilitate conversations both inside and outside of the national security establishment to ensure that the U.S. utilizes a precious national security asset: the creativity and ambition of nontraditional performers.

Reaching Nontraditional Performers

In order to appreciate how the limitations of the FAR and the cultural imperatives of the national security establishment adversely affect nontraditional performer engagement, it is helpful to get inside the mind of an entrepreneur and see how the "ideal customer call" works from an entrepreneur's perspective:

Entrepreneur:	"Hi. Do you like my product? Would you like to use it"
Customer:	"Yes. I would!"
Entrepreneur:	"Great. Who makes the decision?"
Customer:	"I do!"
Entrepreneur:	"Will you pay the price I am asking?"
Customer:	"Absolutely."
Entrepreneur:	"What do I have to do to get paid?"
Customer:	"Send me the product. I will pay you immediately."

Entrepreneur:	"Anything else I need to do? Do I have to change how I operate my business? Accounting? Legal paper work? Anything?"
Customer:	"Nope. Just do what you do. As long as I can get more of your product when I need it, we're good."
Entrepreneur:	"And if you want to buy more?"
Customer:	"I'll just send you an order or give you call"

Compare the "ideal customer call" conversation to the entrepreneur's view of dealing with a government customer:

Entrepreneur:	"Hi. Do you like my product? Would you like to use it?"
Government Customer:	"I can't tell you that. Send me a White Paper describing your product and how it relates to opportunities and needs that we have published in public form."
Entrepreneur:	"OK. I'll spend the time and money to do that. Once I send it to you, who makes the decision? You?"
Government Customer:	"Well, it's not going to be me. It will be someone else who doesn't know you and isn't having these conversations."
Entrepreneur:	"Will you pay the price I am asking?"
Government Customer:	"Probably not. We'll want a discount. And we'll probably need to ask you make changes so that it conforms to our particular specifications."
Entrepreneur:	"Hmmmm. Well, you know that I can sell my product in the larger private market without changing it. What do I have to do to get paid?"
Government Customer	"Send us a sample of the product. We'll evaluate it. Probably talk with our current vendors about it to make sure it works with their technologies. Then we'll have to enter into a contract, or find a contract for you to sub. I'm probably missing something . . .. And we'll pay you eventually."

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Entrepreneur:	"Oh. That's all . . .. Anything else I need to do? Do I have to change how I operate my business? Accounting? Legal paper work? Anything?"
Government Customer:	"Well, yeah. There are specific rules for how we'll need to contract and how you handle your business. And, yes, we have accounting reporting requirements too. It's pretty different from just selling to a private customer. The first time is the hardest. But it will be easier next time!"
Entrepreneur:	"Next time?" [click]
Government Customer:	"Hello?"

However well-intentioned, the FAR creates a process for dealing with government-as-customer that is very far away from how many nontraditional performers would like to be rewarded for their activities. This gap causes many nontraditional performers to just not bother to engage with the government at all.

As the nation faces these new national security realities, our national security agencies have sought to come up with different ways to overcome the disincentives that the FAR impose so as to increase the nontraditional performers' interest in, and ability to, work with the government. These approaches generally share as a common characteristic the identification and engagement of nontraditional innovation sources and their retention in a manner that is more comfortable and familiar to them.

To date, activities to engage with nontraditional performers in ways that are more consistent with the "entrepreneurial ideal customer call" fall into three main categories:

- **Problem Focus:** Efforts to make it easier for nontraditional performers to work with a national security agency to solve a specific and time-limited problem on a "one-off basis."

- **Project Focus:** Efforts to make it easier for nontraditional performers to work with a national security agency on a directed research challenge or project over a longer period.

- **Product Focus:** Efforts to make it easier for nontraditional performers to sell a completed technology or product created outside of traditional federal research and product development or processes.

The lines between these approaches are not hard and fast. For example, attracting nontraditional performers through a competition, can be a Problem-focused approach, but it also could be a means to promote the availability of Project-focused innovation opportunities.

Problem-Focused Innovation Activities

Prize Competitions

Competitive inducements have been used by philanthropists to promote accomplishments in science and technology since at least the 18th century. For example, the first solo flight across the Atlantic and the first privately-launched suborbital flight were both promoted by privately-funded prize competitions. Competitive inducements, generally described as "prize competitions," differ from "recognition prizes" (for example, the Nobel Prize) in that prize competitions reward performance against a future objective, while recognition prizes reward past performance. Starting in 2003, Congress has enacted a number of legislative changes to facilitate the use of prize competitions to assist innovation discovery for national security agencies. These changes work both within and outside of the FAR to provide mechanisms to induce nontraditional performers to provide their entrepreneurial energy to specific national security problems (and, as will be shown below, to projects also).

In prize competitions or challenges, an agency usually offers a prize for solving a problem or triggering a higher density of research and development activities, particularly from nontraditional performers. The usual prize is money, and even though the amount is generally small, it is sufficient to draw competitors. But sometimes the biggest (and only) prize is psychic gratification – also known as bragging rights.

The Defense Advanced Research Projects Agency ("DARPA"), the National Aeronautics and Space Administration ("NASA"), and DOD have benefitted from specific Congressional authorization to use prize competitions in a number of defined situations. Since 2004, DARPA has relied on these authorizations to pursue a number of prize competitions focused on Project-focused innovation. NASA has also pursued a range of prize competitions, some of which are Problem-focused and some which are Project-focused. NASA has been the most active national security agency in the use of prize competitions, using competitions to obtain nontraditional insights to solving aerospace technical challenges or improving astronaut glove design, among other activities.

During this period the DOD undertook one experimental application of prize competitions through a special authorization of Congress. In 2007, the DOD held a prize competition to

obtain nontraditional performer insights into how to develop long-endurance lightweight power packs for war fighters in the field. The competition had precise specifications for the winning submission in terms of weight and energy output. The total prizes awarded were $1.75 million, and the competition resulted in the DOD receiving novel solution from nontraditional sources.

Over the last three years, the Obama Administration and Congress have worked to expand the use of prize competitions by other agencies, including other national security agencies. A visit to www.challenge.gov will provide a flavor of how prize competitions are now being used by some national security agencies to obtain insights and problem solutions from nontraditional performers. With the changes in regulation and a greater emphasis on the use of prize competitions, a broadening range of national security agencies are utilizing them to reach nontraditional performers. NASA is leading a Center of Excellence for Collaborative Innovation to provide agencies with guidance and assistance on creating and executing prize competitions. As national security agencies are applying prize competitions to Problem-focused innovation, they are discovering their utility as a means to engage nontraditional performers.

In 2012, Air Force Research Labs ("AFRL") used a prize competition to solve a vexing problem: how to stop a car or truck that is moving at high speed without harming the driver or bystanders. The solutions provided by traditional performers all required pre-positioning of the solution and the driver being cooperative enough to provide prior warning of his driving path – a less than optimal requirement in the unpredictable real world. AFRL offered a $25,000 prize for an innovative approach to this problem. The winner – a citizen of Peru who had learned of the competition through online publicity – submitted a novel solution that combined a remotely controlled toy car and an airbag. To take control of the targeted car (or truck) – and bring it to a safe stop – the operator would drive his vehicle towards the targeted vehicle, match its speed and direction, and shoot a remote controlled toy car that would "drive" forward. When it was underneath the targeted vehicle, the operator would inflate an airbag on the top of the remote controlled car. The inflated airbag would then lift the drive wheels of the targeted vehicle off the ground, and allow the operator of the remote car to control the target vehicle's movement and bring it to a stop.

More recently, IARPA used the INSTINCT "Trustworthiness Challenge" to draw out software that would solve the problem of how to measure the factors that cause individuals to trust each other. This challenge offered a total prize pool of $40,000; the goal was the ultimate delivery of a software solution (including source code) and written documentation. Another example is the Additive Manufacturing Grand Challenge recently issued by Virginia Polytechnic Institute and State University (more commonly known as "Virginia Tech") and sponsored by the Air Force Office of Scientific Research ("AFOSR") and the Army Rapid Equipping Force

("ARMY REF"). This competition provided a total of $15,000 in prize money to encourage students (who are the quintessential nontraditional performers) to create new designs for remote piloted air and ground vehicles constructed primarily of 3D printed parts – drones that could be built in the field. The challenge was used to raise awareness of the broad possibilities of on-demand manufacturing in remote locations.

TALOS

A different approach was seen recently in what's commonly referred to as the "Iron Man" program. For its Tactical Assault Light Operator Suit ("TALOS") Program, U.S. Special Operations Command ("SOCOM") reached out to academia, entrepreneurs and laboratories to identify potential technology approaches to build a TALOS. Taking advantage of public awareness of Marvel Comics' "Iron Man" character as a result of three blockbuster films, SOCOM promoted widely through the media (as well as more customary sources of government communication of technology opportunities) its desire to build a "real world Iron Man suit." Simply put, it used nontraditional means of communicating government needs to capture the attention of people who ordinarily would not be aware or care about the opportunity to problem solve for a national security agency.

This outreach was intended to do two things: first, raise awareness of SOCOM's needs and second, get a broad constituency of nontraditional performers to address the technical challenges in building an assault suit with enhanced mobility and protection technologies. By all accounts, the outreach achieved its goals and SOCOM was able to organize a broad community of interested participants in problem solving – cutting across traditional and nontraditional sources. SOCOM described the clustering of participants as a collaborative "scrum," thereby pleasing rugby fans of all ages while also describing in a somewhat visual form the process of engaging groups of people in the rough and tumble world of rapid innovation.

SOCOM used these scrums to identify partial or complete solutions and to advance the technologies necessary to build and deploy a TALOS. Interestingly, the scrums themselves didn't result in funding or any specific prize. This was a situation where the psychic gratification – doing something cool – was sufficient to engage a broad range of nontraditional performers and the imagination of the broader technology community. Additionally, as will be discussed below, SOCOM was able to create a community of interested nontraditional and traditional performers to work on the second phase of the program – creating a functional TALOS for the warfighter.

The key attributes of these Problem-focused innovation activities are speed and flexibility, attributes that nontraditional performers value highly. Problem-focused innovation activities allow the government to look and act entrepreneurial and to attract individuals that otherwise would not be interested in engagement. But speed and flexibility are not sufficient for a complete solution. To date, prize competitions do not provide a smooth "on ramp" for doing business with the government; they are not sufficient to create the "ideal customer call." The "winner" may get a prize for his solutions (and may convey the solution to the government in exchange). But prize competitions do not create an opportunity to create a business around the solution, or a business around providing technology insights. They are by their nature "one off" transactions.

What prize competitions can do very well, however, is to create sufficient activity for the agencies to identify recipients for subsequent funding awarded through traditional funding mechanisms that comply with the FAR. Therefore, Problem-focused innovation activities could in some ways be thought of as a "seeding" activity, where the output result is greater nontraditional performer awareness and participation in subsequent innovation activities sponsored by national security agencies. Although the use of prize competitions for Problem-focused innovation is still a very small part of the overall research and development activities pursued by national security agencies, the uniform reaction of the program managers who utilize these approaches is that they obtain valuable insights to solving real world problems from nontraditional sources. Moreover, these solutions are obtained rapidly, flexibly and for a relatively small amount of capital.

Project-Focused Innovation Activities

One drawback of the FAR is that it makes it difficult for a government representative to provide insight on government needs and requirements on a preferred basis. This makes it very difficult for a program manager to help "shape" the product offerings of potential vendors. In the private sector, a startup company's ability to receive detailed customer feedback at the earliest stages (often before a first product is even shipped) is seen as an essential strategic step. Because the FAR limits how much specific feedback and insight can be provided, creating products for government use can be much more of a black box, making it riskier than a private transaction and thus less attractive to the nontraditional performer. From the program manager's perspective, the restrictions on feedback and advice limit the government's ability to rapidly foster new technology solutions.

Project-focused innovation activities are a direct response to these problems. They allow a nontraditional performer to work with government personnel on a potential product or solution over an extended period of time *before* a FAR compliant contract is entered into between the nontraditional performer and the government (if at all). This allows the national security agency to influence and engage with nontraditional performers to shape the ultimate deliverables resulting from the project (which could be a product, or series of products or other deliverables set by the agency in connection with the project). And in many cases, it also allows for the creation of a community of interest that can be sustained for a longer period of time than does a prize competition clustered around a specific problem.

With the exception of the application of prize competitions to Project-focused innovation, the other approaches described below have not been specifically created by legislation. Therefore, they require both more creativity on the part of program managers and greater tolerance for new approaches from supervisors and contract officers. Accordingly, Project-focused innovation activities are not as widely applied to date as Problem-focused innovations. However, as will be seen below, a number of the experimental activities already undertaken have produced promising outcomes.

The greatest advantage of the Project-focus innovation activity is the government representative's ability to shepherd and influence the project without violating the requirements of the FAR. The second greatest advantage is that it provides the nontraditional performer with the ability to attract larger amounts of funding and a longer performance horizon in comparison with the Problem-focused innovation activities. Also important is that Project-focused innovation activities maintain significant flexibility. For example, some Project-focused innovation activities include a contract intermediary, or a contract vehicle, as a way to provide an "on ramp" for subsequent project development.

Prize Competitions to Promote Project-Focused Innovation

DARPA's use of prize challenges to promote Project-focused innovation is instructive. To date, it has used the prize competition approach to address three specific areas where nontraditional performers are currently heavily engaged: autonomous vehicles, robotics, and cyber security. DARPA Grand Challenges have operated since 2004. Its initial application was to spur the development of technologies to create fully autonomous vehicles. Over a series of years, self-identified teams of both traditional and nontraditional performers designed software and platforms to complete an obstacle course within a fixed time. As was the case for utilizing prize competitions for Problem-focused innovation, the only financial inducement for teams was winning a prize. Ultimately, DARPA was able to use this process to identify a broad range of

potential approaches and to foster the creation of an ongoing community of interest composed of traditional and nontraditional performers targeting the creation of a new industrial sector.

More recently, DARPA has applied the challenge model to accelerating innovation in robotics and fully automated cyber defense systems. Unlike earlier Grand Challenges where only prize money is available, some initial funding from DARPA was available for participating teams in these more recent competitions. Teams were self-organized and composed of both traditional and nontraditional performers. Because DARPA money was available, teams did not have to raise their own initial funding to participate in these challenges. The "prize" was additional funding for teams that delivered results that DARPA thought were worth additional work.

NASA has sponsored its own Centennial Challenges in specific areas of robotics and power management. For example, it is currently running a prize competition to encourage the development of a solar-powered robot that can operate on stored energy for a significant period of time. The expressed goal of this challenge is to spur development of batteries that can operate in extreme environments like space missions. Another NASA competition focuses on encouraging the development of autonomous rough-terrain robots that can find and retrieve geologic samples. These challenges, and others funded by NASA, are focused on broader technology development, rather than identifying possible teams or vendors for further FAR compliant research or acquisition contracts. They also generally involve an intermediary and partnering organization that publicizes the competition, solicits participants and manages event logistics.

Cyber Fast Track Program

DARPA's Cyber Fast Track Program was designed to test whether an accelerated process of identifying and engaging with nontraditional performers could result in the delivery of innovative research and product ideas in software technology, specifically cyber security technologies. The program combined the use of a single contracting intermediary with a streamlined review and contracting process. The contracting intermediary was solicited and engaged through standard FAR contracting rules, with an important operational criterion: the intermediary had to have sufficient technical ability, operational structure and resources to assist the program manager in evaluating applicants on technical merit and to manage the onboarding and oversight of selected projects. What made this contracting intermediary special, however, was that it could not be engaged in business activities that would be perceived as competitive to the nontraditional performers' areas of commercial interest.

The intermediary was engaged and received funds at the outset of the program to allocate to selected projects on a rapid basis. The intermediary held the funds pending disbursement to individual nontraditional performers. Funding flowed to the selected performers based upon the preparation and execution of purchase orders incorporating required compliance terms from the intermediary contract. Using standardized purchase orders dramatically lessened contracting complexity for each nontraditional performer. The Cyber Fast Track Program was publicized in the traditional outlets used to promote government-related business opportunities, but because of its unique approach, it received broader media coverage (including coverage in the popular tech press) as well as being the subject of significant discussion buzz in the nontraditional performer community.

The application process was streamlined, both on the front end (applications were available and submitted through an online process) and on the contracting end, where projects were undertaken on the basis of specific purchase or task orders under a master agreement with the intermediary. The intermediary and the program manager reviewed all applications together, and the average time to complete and fund a task order was five days from funding decision. Funding amounts were generally in the range of $50,000 to $100,000 per project. Performance periods were also short, and quick delivery was encouraged.

The Cyber Fast Track was very well received by the nontraditional performer community. It resulted in more than 120 distinct research products and deliverables in the area of cyber security. Additionally, it helped identify DARPA as a source of innovation opportunities to nontraditional performers previously unaware of the possibilities DARPA offered. Moreover, participants in the program often expressed happy surprise in "how easy it was" to deal with the government and how their experience in Cyber Fast Track was very different from what they had been conditioned to expect from a government program.

Innovation House Program

Innovation House was a DARPA initiative to evaluate whether researchers could generate unique research output or approaches when provided with a residential opportunity modelled on successful private sector business accelerator programs. In a business accelerator program, startup entrepreneurs are required to cluster into a cohort and work for a focused period on the creation of a business. The best known business accelerator program is the YCombinator accelerator program, which has "graduated" many well-known Internet businesses, such as Dropbox and Airbnb. The concept behind Innovation House was to provide many of the benefits of a business acceleration program – access to mentors, opportunity for information and experience sharing, and innovation development – in the context of a DARPA research initiative.

The Innovation House program contracted with a university under standard FAR contracting rules and processes. The university provided the physical and operational infrastructure for the program. Research team members and external resources were obtained through research grants, consulting agreements and purchase orders under the master agreement, thereby providing for speed and simplicity of contracting. Research teams were solicited through traditional means and nontraditional media outlets. Teams came from government labs, traditional performers, universities and nontraditional performers. The residential portion of the Innovation House program lasted approximately 60 days. During that time, participants had access to mentors both within and outside of government. The DARPA program manager had opportunities to engage in regular discussion and feedback with researchers, thereby accelerating discovery and evaluation of methodologies and approaches.

The Innovation House program resulted in research progress in a number of areas pursued by teams, as well as at least one commercial prototype by a nontraditional performer. Program participants rated the program very highly as an experience, and a number of teams continued to collaborate on projects seeded by the program.

OTA Consortia

"Consortium" is a term used in the private sector to describe a collection of similarly interested actors to pursue a collective activity, such as a trade group or commercial venture to promote industrial development. In the context of the government obtaining innovation from nontraditional performers, the term refers to a use of Other Transaction Authorizations ("OTA"). The OTA is a contracting authorization scheme that is outside of the FAR. It is used to create a special type of consortium ("OTA Consortium") that provides significant efficiencies for engaging and acquiring products from nontraditional performers. An OTA Consortium comprises nontraditional performers and traditional performers are organized into a single group. This aggregation can occur as a result of agency encouragement or through the guidance of an initial consortium manager selected by the agency through the FAR. The OTA Consortium must have legal existence separate from its members, and membership must have some economic cost and significance to the members. Generally, OTA Consortium members must come together and form a membership organization (generally a not for profit entity or a business association) and there should be some sort of indicia of membership (generally dues) and other membership criteria that are relevant to the consortium's purpose.

The members of an OTA Consortium then select an ongoing consortium manager. The consortium manager is tasked with the day-to-day management of the OTA Consortium for the benefit of the member. The OTA Consortium manager is supported by members' dues or from

commissions generated by funding obtained from government agencies that utilize the OTA Consortium to object research or products from members. The OTA Consortium manager also needs to have sufficient technical abilities and operational resources to oversee the allocation of funding to OTA Consortium members.

From the perspective of obtaining products or projects from nontraditional performers, a properly formed OTA Consortium has significant advantages. The agency can provide a block of funding to the OTA Consortium manager or it can fund the consortium on a project by project basis. The funds are allocated to members as and when determined by the agency in consultation with the OTA Consortium manager. The contracting process is largely managed between the OTA Consortium manager and the agency, so that the contracting process for individual OTA Consortium members to receive funding is significantly streamlined. Significantly, the rules surrounding an OTA Consortium allow for the nontraditional performers to avoid many of the complexities of being a FAR-compliant contractor. This allows nontraditional performers in an OTA Consortium to operate in a fluid and flexible environment, allowing them to focus more on the innovation activity itself and less on the compliance side.

The Army has been particularly active in using the OTA Consortium as a way to obtain technology research and development and prototyping from nontraditional performers. It has formed consortia in robotics, nanotechnology, defense ordinance, rotorcraft and other areas of national security importance. The Army has used OTA Consortia in a number of circumstances as a way to obtain completed technology research and development and eventually completed products from nontraditional sources, and to create connected ecosystems of vendors in areas where acquisition rapidly was highly relevant.

TALOS As a Hybrid Approach

Although many aspects of the TALOS approach are best categorized as a Problem-focused innovation activity, the TALOS program is also an example of a Project-focused innovation activity. SOCOM uses intermediaries to engage with nontraditional (and traditional) performers. SOCOM requires participants in the TALOS program to enter into joint collaboration agreements to facilitate data sharing among participants. This approach allows otherwise unaffiliated individuals and organizations to work together and to decide on degrees of participation and investment: they can decide how much information and expertise they want to contribute to the shared collaboration and balance this against the benefits they receive in learning from other participants. This high level of shared transparency means the TALOS program manager is also freer to speak with the nontraditional performers about their research and product plans in order to overcome the technical and design challenges.

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From SOCOM's perspective, the most significant departure from previous attempts to reach nontraditional performers is that TALOS is multi-dimensional. Instead of pursuing a linear process marked by one-to-one contacts between SOCOM and the performer, the TALOS program is designed to create and manage "many-to-many" discussions and interactions and feature them prominently.

In is important to note that while SOCOM has developed nontraditional ways to bring innovators together and to identify solutions, the contracting and acquisition processes still follow a more traditional FAR compliant tack. The value of the TALOS program is rapidity and flexibility. Perhaps it is best thought of as a hybrid model that brings together the benefits of Project and Problem-based innovation activities.

Innovation Sandboxes

In certain areas of national security, the ability to evaluate and shape technology solutions and innovations is limited not just by the FAR and cultural limitations but by the need for secrecy. Providing "real world" testing and evaluation opportunities in a security-cleared environment can be difficult. Additionally, the difficulties of deploying software and solutions into existing mission critical locations severely constrains the development of new approaches and technology. For example, it is hard for a potential performer to demonstrate capabilities unless he has access to the actual mission requirements or access to the technology platform his product will be used in. To address these difficulties, some national security agencies are working towards creating static platforms for testing and evaluating new technology innovations and access to data that is rendered safe for non-security cleared consumption. In other words, performers can try out their products in a simulated environment, so that an agency can assess the proposed product without giving up secret information. By doing so, the national security agency can accelerate the time period for a performer to see whether its product is suitable for consideration by the agency.

The Defense Intelligence Agency ("DIA") and National Geospatial-Intelligence Agency ("NGA") have both recently announced online platforms that will be available to nontraditional and traditional performers. The DIA's Open Innovation Gateway is an internet-accessible environment to which any potential vendor can apply for access. The application process is outside of the limitations of the FAR. Once accepted, the performer can have access to a secure software environment that emulates the actual software and hardware environment of the DIA. This allows the performer to demonstrate his product in a "real world" setting, and it allows DIA to assess the product's capabilities. The ultimate acquisition of the product is done in accordance with an accelerated process described below in "The NeedipeDIA Example."

The NGA has taken a somewhat similar approach in its GEOINT Solutions Marketplace. However, in addition to creating a secure emulation environment in which potential performers can test and submit their products, the NGA is also attempting to normalize the environment for delivery of products by creating common technology standards. For example, although still in the early stages, the NGA is attempting to create an app ecosystem for national security related phones and computers that would operate similarly to private app ecosystems like those that have grown up around the iPhone and Android phones.

Innovation Mentorship

Innovation mentorship describes national security agency activities to engage with nontraditional performers and to provide specific guidance on how to develop a product or approach to solve specific customer requirements. Mentorship is very difficult to accomplish through the limitations of FAR, until such time as a performer becomes part of the system through a FAR-compliant process (for example, a contract to purchase services or receipt of an SBIR grant). One of the advantages of the Product-focused innovation activities described above is that the process allows the agency to mentor participants. The ability to have an ongoing engagement with a nontraditional performer, to shape research and the ultimate output is particularly important to early stage technology businesses where customer feedback and a path to early revenue is the life blood for initial success.

In-q-Tel is an independent not for profit corporation that is not part of the federal government. It operates by way of contract. Launched in 1999, its mission is identifying and investing in companies developing emerging technology products that would be of interest to United States national security agencies. It evaluates products originating with nontraditional performers, using a technical staff with expertise in technology sourcing and evaluation. National security agencies that utilize In-q-Tel for product-focused innovation activities include the Department of Homeland Security ("DHS"), the CIA, DIA, and NGA.

In-q-Tel started its operations as an investment-focused activity, where In-q-Tel attracted nontraditional performers by positioning itself as a venture capital investor. Part of what makes venture capital investment attractive to entrepreneurs is that mentoring by the investor is a de facto term of the investment, as is the investor's steering the growth of portfolio companies. This mentoring and steering is what allows venture capital firms to help their portfolio companies develop products that will be fill a market need. The particular structure of the relationship between In-q-Tel and the agencies allows portfolio companies to provide products to agency customers outside of many of the limitations of FAR. In combination, In-q-Tel's investments and relationship with the agencies create a pipeline for selected nontraditional

performers into the agencies. Over time, the investment portion of In-q-Tel's activities has been de-emphasized, and its role as a technology evaluator and facilitator of product sales with its agency customers has been emphasized. In-q-Tel is a unique organization within the national security establishment.

Product-Focused Innovation Activities

It is widely acknowledged that the FAR has erected considerable impediments to contracting to purchase completed products from nontraditional performers. From the standpoint of a nontraditional performer, the most significant barriers are time to signed contract, accounting and reporting requirements, and lack of transparency related to government requirements. A complete discussion of the many different issues relating to purchasing products from nontraditional performers and the attempts to address these is beyond the scope of this Report. This section of the Report will instead highlight some initiatives to facilitate acquisitions of completed products in a manner that is closer to the "entrepreneurial ideal customer call."

Types of Product-Focused Innovation Activities

Project-focused innovation activities focus on three areas:

- Timeline acceleration. In some circumstances, national security agencies have focused on improving timelines through process improvement. Aspects of the TALOS program specifically focused on timeline acceleration. While acquiring products for warfighter agencies such as ArmyREF during the Iraq and Afghanistan wars, the Combatting Terrorism Technical Support Office and others devoted significant resources to staffing and process improvements to shortening the time between identifying a product for acquisition and acquiring it.

- Process modification. Instead of focusing solely on speeding up the acquisition timeline, some approaches attempt to adapt the process to be more suitable for nontraditional performer engagement. As the Report describes below, DIA has changed the way that it will seek to acquire certain products by creating a streamlined contracting process. The NGA, ArmyREF and other agencies are working to create common standards for the acquisition of digital media products (such as apps or templates for additive manufacturing). The Cyber Fast Track Program created a rapid process for soliciting, reviewing and funding research proposals, which was recognized by nontraditional performer participants as being very close to the "entrepreneurial ideal

customer call."

- Contract innovation. It also is possible to work outside of the FAR in substantial ways to accelerate product acquisition from nontraditional performers. Use of the OTA Consortium model by the Army provides specific examples of this approach. In-q-Tel is another illustrative example, where its "investment" is often a contract with a government entity to purchase the product developed by a nontraditional performer. In its new GEOINT Solutions Marketplace, the NGA has fostered the creation of a consortium, presumably to gain some of the advantages of an OTA Consortium to facilitate its marketplace.

The NeedipeDIA Example

A recent initiative of the DIA, NeedipeDIA (rhymes with "Wikipedia") is worthy of special mention as a timeline and process modification. NeedipeDIA is designed to communicate DIA's mission needs to innovators, to match and address these needs with creative solutions, and to facilitate a more rapid acquisition process by connecting innovators, including nontraditional performers, directly with end users. It is a contracting and acquisition process that is designed to work in conjunction with the Open Innovation Gateway.

NeedipeDIA lists ten categories of mission needs, including "prevents strategic surprise," "supports contingency response," "new analysis technologies and methods," "enhances counterintelligence and security," "human intelligence capability development," "mission enhancing science and technology," "improves mission support capabilities," "enhances technical collection," "increases organizational effectiveness," and "empower partnerships." There is an eleventh bucket for "other innovative capabilities not listed above" so that nontraditional performers and all innovators can submit ideas for new capabilities that DIA does not yet know that it needs. This eleventh bucket is in itself uniquely different from FAR compliant solicitations where the government focuses on what it thinks it needs. NeedipeDIA focuses on initiatives that require less than $650,000 and that can produce technologies ready for acquisition within six months.

DIA end users communicate mission needs directly on the NeedipeDIA site in the form of wiki-style posts that replace the traditional processes for solicitation of proposals. A nontraditional performer or other innovator can start the dialogue by submitting a two-page white paper, which is substantially shorter than a traditional white paper requirement. The person who has communicated the specific need typically evaluates submissions quarterly, although some categories are reviewed at four or six month intervals, depending on the mission

need. This innovation approach puts performers directly in communication with the end users who articulated the need. Additionally, the NeedipeDIA site provides clear and concise instructions on how to submit an idea and how to maximize the chance of a successful proposal.

A good rule of thumb for a FAR compliant solicitation process by an agency asking for new capabilities is six to nine months to execute. DIA expects NeedipeDIA to reduce the friction associated with communicating needs, identifying and accepting new ideas, and converting these ideas into action and dramatically shorten this time line. The agency seeks to lower barriers to entry for innovators, which will be especially beneficial to nontraditional performers, and, ultimately, to reduce lead times by streamlining the entire acquisition process to 30-day cycles using NeedipeDIA and the Open Innovation Gateway.

Product-focused innovation activities have a meaningful advantage for the national security agencies when they are executed successfully: the nontraditional performer can become a long-term partner, used to working with the government customer in a collaborative, rather than an arms-length (or worse, adversarial) relationship. And the nontraditional performer benefits too, since it gains access to new markets. When the national security agencies create these innovative "on ramps," both parties benefit. But creating a successful on-ramp doesn't happen by accident. It takes the congruence of customer need, program leadership, and contracting officer comfort and creativity.

Which Innovation Approach is best for a National Security Agency to Use?

The foregoing discussion demonstrates that there is a broad range of innovation discovery approaches available to increase nontraditional performer engagement. Increasingly, the issue of whether and when nontraditional performers can be utilized by the national security agencies is not limited by availability of avenues to avoid the constraining influences of FAR. Interestingly, in connection with the preparation of this Report, the author spoke with a broad range of national security agency staff, the operators of many of the programs described in this Report and a cross section of nontraditional performers. The almost universal view point of interviewees was that these approaches allowed national security agencies to motivate nontraditional performers and obtain unique research, solutions and products.

To assist future and expanded use of these approaches, what follows are some suggested guidelines for government program managers to apply when evaluating which to approach is most suitable to the task at hand. Evaluation against considerations such as level of complexity, publicity, time period, desired output (i.e., problem, project, or product), clarity of intellectual

property ownership, commercial requirements, and funding levels will affect the desirability and suitability of a specific approach. Before any approach can be selected and applied effectively, a government agency should evaluate its goals by asking these six key questions:

- **Does the approach align government requirements with nontraditional performer expectations?** Expectations are mismatched, for example, when the government is looking for rapid innovation, but its outreach attracts nontraditional performers looking for commercial opportunities. This scenario often manifests itself with a nontraditional performer's observation that an innovation approach will not provide an "on ramp" to a longer term opportunity. The performer is unhappy because he misunderstood what was sought.

- **How is intellectual property handled?** Every approach described in this Report allows for the allocation of intellectual property rights and commercial opportunities both inside and outside of government. However, they are not identical. There is a big difference between a competition in which no private intellectual property rights protection is possible or in which they are "given to the government," on the one hand, and a product sale to a government entity. The rules of the road for each approach must be stated clearly. Additionally, approach selection should be made against the filter of whether or not the proposed intellectual property treatment is proportionate to the nontraditional performer's investment. Participation in a competition for bragging rights to a solution for a specific problem (e.g., a new idea for flavoring space food) likely is very different from a multi-factor validation process that could prevent misappropriation of internal data (e.g., the stakeholder-managed authorization controls that will be available in DIA's forthcoming Open Innovation Gateway).

- **Is there sufficient congruence between the problem set, the government leadership, and the contracting officers?** Many leaders within the government already agree that FAR exceptions can be found and improvements can be made. The recurring theme in the ideation process and subsequent adoption of new approaches for obtaining innovation has been whether or not there is sufficient appetite and willingness on the part of government actors to commit to these changes—and it is clear that changes occur more frequently where there is significant leadership and direction from governmental authority.

- **Will an approach attract the "right" nontraditional performers?** Nontraditional performers often cluster in communities of interest (e.g., cyber or Big Data communities)

or locate in specific geographic regions (e.g., Silicon Valley). An approach that will resonate with the target community should be selected. For example, nontraditional performers in a Big Data community may be more motivated by the prospect of playing with government data in a sandbox than by the thought of winning a problem-specific competition.

- **How does the innovation approach mesh with existing methodologies?** Determining whether an approach reinforces or undermines traditional sources for obtaining innovation is critical, since competition for resources like money and authority can cause unproductive tension. Identifying whether an innovation approach can be undertaken within existing reporting and operational structures is an important consideration.

- **How should the approach and the opportunity be publicized?** The most brilliant approach will fail if nontraditional performers don't learn about it. Government agencies' most frequent complaint heard after they try a new approach has been that they "got applications from the usual suspects." Engaging with nontraditional performers requires providing information about opportunities in the way they want to be contacted.

Concluding Observations

The range of experiments that national security agencies have undertaken to engage with nontraditional performers is surprisingly – but encouragingly – wide. Nevertheless, the level of application to national security challenges when measured against the overall consumption of innovation through FAR compliant pathways is very small. This large gap is both an opportunity and a threat to our national security.

The use of prize competitions is the most widespread approach used to date. It provides significant operational advantages when compared to obtaining research and solutions from nontraditional performers using traditional means. It however offers relatively little to a nontraditional performer looking to start a business, or sell a completed technology to a national security agency. Project-focused and Product-focused innovation approaches offer more promise for creating a pathway for nontraditional performers to create products and grow national security businesses. However, the approaches described in this Report are less widespread than prize competitions, and to this point require a greater tolerance for working to find "loopholes" within the FAR, or contract mechanisms to avoid it. Moreover, proof of the utility of Project and Product-focused innovation activities is limited by a relatively small data

set. To move from the nature of one-off experiments to widespread adoption additional work must be done. At this time, the structural impediments of the FAR and the inherent conservatism of the national security establishment have limited national security agencies' abilities to develop and apply these various innovative approaches.

Nevertheless, further adoption and enhancement of these approaches is a national necessity, as evolving national security threats and Congressional budgetary priorities compel creative and nontraditional approaches to innovation challenges and encourage innovation as a way to "do more with less." Accordingly, actions by government entities to share innovation practices and to promulgate and promote them more widely seem necessary and likely in the near and intermediate terms. The following actions are recommended for consideration:

- Consistency with FAR or exemption. Clarify the applicability of nontraditional approaches to dealing with the limitations of FAR in order to encourage wider adoption by government personnel. Create an interagency coordinating group to evaluate the FAR's limitations on nontraditional performer engagement.

- Better coordination. Encourage cross agency coordination to create opportunities to engage with nontraditional performers in specific areas of vertical interest; for example, robotics or cyber security, rather than agency-specific activities.

- Learn from the "best practices" of In-q-Tel. Evaluate the In-q-Tel model, and consider expansion and application to other areas of need within DOD. Identify and promote other mechanisms to facilitate innovation mentorship by the national security agencies.

- Interact with nontraditional performers the way they prefer. Establish relationships with organizations that can curate communities of interest with nontraditional performers both on line and in the physical world; create one or more national security agency related entities that look "entrepreneurial."

- Take a closer look at "traditional" programs to reach small business. Evaluate existing programs to engage small businesses, particularly the SBIR program, to determine if some of the benefits gained by nontraditional engagement models can be applied to programmatic approaches to R&D.

- **Eliminate "friction" in the system.** Evaluate and address impediments to acquisition of products and services from nontraditional performers due to cultural factors and attitudes.

About the Author

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Jonathan also the founder and Managing Director of TandemNSI (www.tandemnsi.com), a program funded by the Commonwealth of Virginia and supported by Arlington County EDA to bring entrepreneurs, universities and national security agencies together to accelerate economic development and national security entrepreneurship in the Greater Washington Region. Over the last two years he has assisted both the Office of Governor McDonnell and the Obama Administration in formulating policies to promote start up formation. He has also worked with the Department of Defense Lab directorate, DARPA, DHS, AFOSR, the Army and other national security agencies on various consulting engagements addressing entrepreneurship and technology creation.

Jonathan is also an educator, and he teaches subjects relating to entrepreneurship and technology startups, including corporate finance, business planning, organizational development and new venture creation. He is currently a Lecturer at the University of Maryland's Robert H. Smith School of Business. He is also a regular speaker on topics related to business formation and expansion for groups such as the National Academies of Science, the National Science Foundation, the Northern Virginia Technology Council and others. Jonathan is the co-host of LeftJab Radio (www.leftjabradio.com), a weekly radio show on business, politics and current events broadcast on SiriusXM. He is frequently interviewed and quoted on business topics by national and local news organizations, including Washington Business Report, Huffington Post, the Deal, Potomac TechWire, the Washington Post, and the Washington Business Journal.

Prior to becoming a venture investor, Jonathan had a career in London and New York as an investment banker and law firm partner, working for international investment banks (Goldman Sachs, Donaldson Lufkin and Daiwa Securities) and national law firms specializing in technology law (Pillsbury Winthrop Shaw Pittman, Fenwick & West and Fish and Richardson).

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About Tandem NSI

 Tandem NSI is a public-private partnership funded by a grant from the Commonwealth of Virginia by way of the Virginia Federal Action Trust Fund and supported by Arlington County, Virginia. It is operated by Amplifier Ventures, a venture capital and consulting company that specializes in applying innovation models and access to nontraditional performers to national security technologies and opportunities. Amplifier Ventures has worked with a broad range of national security agencies and universities in a consultative role and has fostered the creation of 16 new technology businesses since 2005.

Tandem NSI is funded to cultivate a vibrant technology ecosystem that connects entrepreneurs, university researchers and students, government program managers, and the supporting business community. Tandem NSI offers programs and initiatives to create awareness of the national security agencies' requirements; it also provides exposure to security products and new approaches developed by nontraditional sources of innovation and the entrepreneurs who launch and grow these companies. Additionally, Tandem NSI seeks to highlight opportunities to accelerate national security-funded small business with mentorship and team building through collaboration with mentors from its affiliated organization, FounderCorps.

For further information on TandemNSI go to www.tandemnsi.com