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**SCHEDULE 14A**

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**Booz | Allen | Hamilton**

**Booz Allen Hamilton Holding Corporation**

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Booz | Allen | Hamilton

# PROBLEMS SOLVED.

*Impact Report 2017*

*Booz Allen  
engineer, Jenny*



## INTRODUCTION

At Booz Allen Hamilton, being a purpose-driven organization means living to solve problems and, together, taking pride in the pursuit. It means making client missions our own, applying a century of consulting with the latest in technology. It means investing in the long term to create opportunities for our future.

It's seen in our work using advanced analytics to combat human trafficking around the world. It's seen in our investment in a high-tech lab to test ideas in cloud computing, software, and open source and assess a multimillion-dollar price tag on a tool to more efficiently uncover fraud. And it's seen in our engineers and scientists helping the Department of Defense develop and test directed energy weapons, which could profoundly reshape the 21st century battlefield.

We fulfill our purpose by showing a solution, not just identifying a problem.

Booz Allen empowers people to change the world. This sense of purpose

encompasses much about us—our client work, our strategic partnerships, our dedication to community. Our people enter each day knowing they can make a difference in society by helping our clients solve their toughest problems, or serving communities in need, and we're there to back them up—with the right tools and the right spirit. The spirit to embrace new ideas, to view challenges as the gateway to new discoveries, and to find the joy in solving the simplest to the most complex issues.

The evidence is in these stories, which underscore Booz Allen's five values: Unflinching Courage, Passionate Service, Ferocious Integrity, Collective Ingenuity, and a Champion's Heart. It's vividly rendered in our work keeping people safe, supporting veterans, confronting cyber challenges, unlocking valuable answers in reams of unstructured data, protecting financial systems, and advancing healthcare.

We are a global firm of diverse,

passionate, and exceptional people driven to excel, do right, and realize positive change in everything we do.

We've built value and opportunity in consulting, analytics, digital solutions, engineering, and cyber, and we support those skills with investments in our culture of innovation.

Empower people to change the world: This is what it means to us to be a purpose-driven organization. And these are a few of the stories of our purpose, one we strive to fulfill for our clients, partners, people, and communities.

*Booz Allen  
employees climbing*





*President and Chief Executive Officer Horacio D. Rozanski (sitting, far right) and Chairman of the Board Ralph W. Shrader (sitting, center right) with the Board of Directors (left to right): Philip Odeen, Ian Fujiyama, Charles Rossotti, Joan Amble, Peter Clare, Melody Barnes, Arthur Johnson, Gretchen McClain, and Mark Gaumont*

# DEAR COLLEAGUES AND FELLOW STOCKHOLDERS,

At Booz Allen Hamilton, fiscal year 2017 was a year of growth and renewal. We had great success winning work that advances clients' most important missions and solves their most pressing challenges. We expanded, diversified, and strengthened our talent base. We further implemented our long-term strategy for growth. And we energized our culture by rearticulating our purpose and values as an institution.

In a fast-changing world, our operational and strategic progress is built on a foundation of shared values and common purpose. And together, those things are propelling financial success. We are very pleased to report an industry-leading<sup>1</sup> performance in the fiscal year ending March 31, 2017:

- Gross revenue grew 7.4 percent to \$5.8 billion
- Revenue excluding billable expenses<sup>2</sup> grew 4.1 percent to \$4.1 billion
- Adjusted net income<sup>2</sup> grew 6.5 percent to \$262 million
- Adjusted Diluted Earnings Per Share<sup>2</sup> were \$1.75, up from \$1.65 in fiscal 2016
- Adjusted EBITDA<sup>2</sup> margin was 9.4 percent, on par with FY16
- Total backlog at fiscal year-end was \$13.6 billion, just below the record level set at the end of the second quarter of the fiscal year
- Headcount grew by more than 700 to 23,300

During fiscal 2017, we again increased our regular dividend and delivered strong total shareholder return, at 19 percent. We also further diversified our shareholder base. The Carlyle Group completed the sale of its equity position in the Company in December 2016. For more than 8 years, Booz Allen benefited from Carlyle's expertise and counsel, and we are proud to have been an excellent investment for them.

Our financial performance rested on a clear plan set out at the beginning of the year and active engagement and stewardship from our Board of Directors. The Board was involved in oversight

<sup>1</sup> Industry consists of CACI, CSRA, Engility Holdings, Leidos, Mantech, and Science Applications International Corp.

<sup>2</sup> These measures are non-GAAP financial measures. For a reconciliation of these measures to GAAP, please see the [Appendix](#).

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**More and more clients—both new and long-standing—see us as the firm that can reliably solve their problems and deliver solutions, a point of differentiation that is bolstered by our growth-strategy investments and firmly grounded in our exceptional people, unique operating model, and collaborative culture.**

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Employees at the 2017 Booz Allen Excellence Awards



and decisions related to corporate governance, strategic planning and competitive positioning, executive compensation, risk management, fiduciary responsibility, and shareholder value creation.

In fiscal year 2018 and beyond, we will continue to strive to consistently deliver near- and long-term shareholder value through strong year-to-year operational performance, effective deployment of capital, and the implementation of our strategy for growth, called Vision 2020.

### **A STRATEGY FOR CONTINUED GROWTH**

Fiscal year 2017 was the fourth year of implementing Vision 2020, which has guided both year-to-year execution of the business and longer-horizon decisions about where to invest to create quality growth that is truly sustainable. It has served as a blueprint as we navigated the contraction of the government market, beginning in 2012, and since our return to growth in 2016.

In fiscal 2017, our global commercial business again produced double-digit growth and our innovation agenda fostered an even more vibrant culture of creativity, teamwork, and possibility. We also grew and further scaled across our client base advanced capabilities in analytics, engineering, cyber, and digital solutions, while integrating them more tightly with our traditional strengths in consulting and mission understanding.

More and more clients—both new and long-standing—see us as the firm that can reliably solve their problems and deliver solutions, a point of differentiation that is bolstered by our growth-strategy investments and firmly grounded in our exceptional people, unique operating model, and collaborative culture.

### **ENERGIZING OUR CULTURE**

Booz Allen's culture has always been central to our success. In fiscal 2017, we rearticulated our shared values and developed a unifying purpose statement for the firm. The result captures both the meaning and motivation behind our work: At Booz Allen, we empower people to change the world. And we do so by demonstrating ferocious integrity, passionate service, collective ingenuity, unflinching courage, and a champion's heart.

We believe these fundamentals help make Booz Allen a lasting, powerful investment. They matter to our clients and our strategic and community partners, and they are tremendously important to the people of our firm. Our purpose and values are, in fact, the core strengths of this institution because they challenge us to constantly reach forward and do better.

Thank you, Booz Allen employees and stockholders, for your contributions to our success this past year. After pivoting to growth in fiscal year 2016, we accomplished even more in fiscal 2017—operationalizing our strategy, accelerating our growth, and, most importantly, empowering people to change the world. We are proud of all that we have achieved together and look forward to the opportunities that lie ahead.

**RALPH W. SHRADER, PH.D.**

Chairman of the Board

**HORACIO D. ROZANSKI**

President and Chief Executive Officer

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*Booz Allen data scientist Joe*



## IDEAS PORTAL DRIVES IT MODERNIZATION

TAPPING OUR POWER OF INNOVATION TO BUILD SMARTER IT TOOLS

*Ram Ravi and his team weren't sure what to expect when the associate chief information officer at one of our largest government clients called them into his office. They quickly found out that he didn't hesitate to tell it like it is.*

*Booz Allen cyber strategy consultant Meredith*



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## The Innovation Incubator ecosystem gives our people access to training and helps us develop new, targeted capabilities. A repeatable, scalable process lets us fuel even more ideas and formalize how we innovate and prototype solutions.

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“He said he was giving us an A+ for the IT digital modernization projects we were developing and delivering,” says Ram, Booz Allen Hamilton’s program manager for this engagement. “But as for innovation? We weren’t making the grade. The client—who carries one of the largest missions for the federal government—expected more.”

Ram and his team knew they needed to get down to work, and fast.

### EVERYONE’S IDEAS ARE VALUED

Enter the portal—a virtual space Ram and his team created where our people could brainstorm and collaborate on fresh ideas.

“We’re empowering our people. We hear their ideas and are acting on them,” says Ram. “That really motivates the team because they see that everyone’s ideas are valued—from the most junior to the most senior person.”

Within weeks, the team had a trove of ideas, all using existing technologies and software—but combining them in inventive ways to solve critical client challenges.

### SOLVING THEIR PAIN POINTS

Around the same time, the then-chief technology officer (CTO) for the client was considering a commercial off-the-shelf (COTS) case management tool that could help the agency achieve its regulatory and enforcement mission more effectively, and which has the potential to help save the federal government from losses of \$3.5 billion annually. But the CTO needed to assess if it could scale to the agency’s large, distributed workforce. The tool had limitations and a hefty multimillion-dollar price tag. With shrinking budgets and aging legacy systems, the CTO also knew the organization didn’t have the resources to quickly build a small-scale prototype to test it.

So the quest to find an idea to solve the CTO’s multimillion-dollar dilemma went to the portal.

“The question was, ‘How could we make their lives easier?’” says Lead Technologist Rocky Penumalli. “We have so much domain expertise with the client. We know their tools. We asked ourselves, ‘How can we solve their pain points with the existing technologies they already have?’”

### A SANDBOX TO EXPERIMENT

With a small \$5,000 investment, Ram and his team formed a lab—an Innovation Incubator. It uses a low-cost scalable infrastructure in the Amazon Cloud, Booz Allen’s Smart Suite application lifecycle management system, and DevOps and open-source tools.

“We created a sandbox, a virtual playground, where our people can really experiment with their ideas,” says Ram.

In the lab, the team identified the proposed COTS tool’s strengths and weaknesses, and technology and process gaps. Then, they built a series of prototypes. It showed how we could solve the tool’s implementation challenges and, ultimately, make the agency more productive in the vital work of rooting out fraud.

Our team of problem solvers was now showing a solution, rather than just *telling* the client’s IT stakeholders about it. Our Innovation Incubator was clearly a game changer.

Since then, we’ve replicated the model to successfully build other prototypes, showing how quickly we can incubate and present our ideas. The clients view us as their “go-to” innovators, and we’ve earned the reputation as a key systems integrator.





*Booz Allen employees  
collaborating*

### LEANING FORWARD AS A TECH ADOPTER

As our people's ideas continued to flow, we realized we needed to tap the collective strength of our vendors as well. We established strategic partnerships with key tech partners such as Redhat, MicroPact, MarkLogic, IBM, Nuxeo, Neo4J, Chef, and Amazon.

The Innovation Incubator ecosystem gives our people access to training and helps us develop new, targeted capabilities. A repeatable, scalable process lets us fuel even more ideas and formalize how we innovate and prototype solutions.

With our innovation mindset and passion for our client's mission, we're tackling the client's IT challenges head on and have fast-tracked the agency's IT modernization roadmap. The result is an agency that's now leaning forward as an early technology adopter, ready to drive its vision of a new, digitally connected citizen services agency.

### A MEETING OF THE MINDS

The Innovation Incubator is not just a change agent for our clients. We're channeling our people's creativity like never before, empowering them with the diversity of their ideas to achieve results. They come to the office early, before starting on client delivery, just to work on Innovation Incubator prototypes.


"There's a lot of quick thinking and hands-on innovation happening in the incubator," says Rocky. "And we're building better solutions for our clients as a result. The fact that there's so much to learn inspires me. It's such an amazing meeting of the minds."

No more building solutions in a bubble: We're collectively embracing our clients' real-world challenges as the starting point for innovation.

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**"We're empowering our people. We hear their ideas and are acting on them. That really motivates the team because they see that everyone's ideas are valued—from the most junior to the most senior person."**

—Program Manager Ram Ravi



## GETTING HELP FOR REAL WARRIORS

MENTAL HEALTH CAMPAIGN  
HELPS MILITARY  
COMMUNITY OVERCOME  
STIGMA

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*When First Sgt. Simon Sandoval lost two Marines in his platoon during a deployment to Iraq, the loss gnawed at him.*



"How did everything get so messed up? Was it my fault? Could I have done this differently?" he asked himself.

Eventually, he began drinking heavily, lost interest in maintaining his health, and pulled away from family and friends.

These invisible wounds can be the hardest to heal. They are certainly some of the hardest to talk about. Booz Allen Hamilton's work on the web-based **Real Warriors Campaign**, a program of the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE), is helping change that, along with addressing the stigma of seeking care among the military community.



"It's a public service initiative designed to encourage service members, veterans, and military families to seek care for psychological health concerns," explains Katie Duthaler, Booz Allen's deputy project manager.



### A SIGN OF STRENGTH

Think of it as an integrated marketing campaign around a social good initiative—where the sum of its efforts are greater than the individual parts—seamlessly integrating Internet content, videos, social media, (**Twitter, Facebook**), free print resources, and a photo-sharing mobile application. The campaign's social media channels alone garner more than 160,000 fans and followers.

It also puts care resources at the fingertips of service members. Content shared by the campaign includes ways for audiences to seek care or learn about additional support resources, including the DCoE Outreach Center, the Military Crisis Line, TRICARE, and the U.S. Department of Veterans Affairs (VA). But it goes further than that. The campaign also fosters an important virtual connection—a digital community of camaraderie and endless support.

Videos are the heart of the campaign, as real stories of those who sought care strike a personal chord with the target audience—18- to 29-year-old service members. These videos demonstrate that people just like them are getting treatment and are still able to progress in their careers and succeed in life. Viewable via the campaign's website, videos are accessible any time, from any location, including overseas via the American Forces Radio Television Service.

They show that reaching out is a sign of strength.

### SEEING SUCCESS, GETTING BETTER

"The people sharing their profiles through this campaign are proving, through example, that service members are going on to have successful careers in the military after seeking care. They're better family members and they're better warriors for getting the help they needed," says Katie. "Service members wanted to see themselves, and they wanted to see success. They don't just want to hear that seeking care worked."

The videos are intensely personal, and explore the complex emotions surrounding combat stress and other mental health concerns. It goes without



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**“Military life is rewarding, but it isn’t always easy,” service members share in another Real Warriors Campaign video.**

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saying that it takes incredible courage to openly share these stories.

Simon shared his personal account, which is featured on the campaign’s website and demonstrated how by opening up and seeking help, he was able to turn his life back around.

“It’s therapeutic,” says Lt. Col. Chris Curtin in the same video. “I think by talking about it, it helps. On the flip side, the Marines he’s talking to benefit as well. If he can talk about this, then [they think], ‘There is nothing that can stop me from doing it as well.’”

**DON’T GO IT ALONE**

The message is resonating with service members.

“We asked our audience to make a pledge that, ‘I can, I will reach out for help,’” says Booz Allen Project Manager Rick Black describing an “I Can, I Will” mini-campaign. “We are seeing and hearing that this matters.”

A recent case in point: A service member who lost a brother in combat saw one of the videos featuring GySgt. Mathew Barr and shared it with his entire family. They were so inspired by what they saw they decided to seek grief counseling together.

“Military life is rewarding, but it isn’t always easy,” service members share in another Real Warriors Campaign video.

The message is clear: Those suffering don’t have to go it alone.

“I can. I will keep my mind and body fit,” they promise the viewer.

“I can. I will be there for my buddies, no matter what. Be there for our veterans, no matter what.”

Launching in 2009 with the goal of reducing the stigma associated with getting help and informing the military community of available resources, the campaign took on an additional mission over the last 3 years of increasing knowledge and awareness of common psychological health concerns.

“Stigma is not the only barrier to care that we see within the military community. There’s also a lack of understanding surrounding what psychological health concerns are, and what kinds of treatments are available,” says Katie. “It’s not PTSD or nothing. It’s not combat stress or nothing.”

Part of the Deployment Health Clinical Center in the DCoE organization, the campaign also boasts an impressive partner network. It’s comprised of government agencies and not-for-profits—local, regional, and national—from the Navy Suicide Prevention and Operational Stress Control Branch and the not-for-profit Give an Hour to service dog and alternative therapy organizations.

More proof that help is only a click, or phone call, away.

## DIRECTED ENERGY: SCIENCE, NON FICTION

USING LASERS AS A 'BLOWTORCH'?  
LEARN HOW WE'RE DOING THAT  
AND MORE

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*From the devastating alien heat-ray in H.G. Wells' War of the Worlds to the handheld phasers that Captain Kirk and crew wield in episodes of "Star Trek," laser weapons have long captured the imaginations of science fiction writers, directors, and dreamers.*



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## Operators can use HPM against electronic targets without the enemy ever being able to determine the source of the damage.

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These concepts are no longer the stuff of science fiction. Booz Allen Hamilton engineers and scientists are helping the Department of Defense (DoD) develop and operationalize directed energy (DE) weapons. With numerous advantages that compliment traditional kinetic weapons, DE has the potential to profoundly reshape the 21st century battlefield.

“Threats are evolving that directed energy better allows us to address, including boost phase defense against advanced intercontinental missiles, armed drones, hypersonic weapons, and swarming tactics,” says Booz Allen Executive Vice President Trey Obering, who is the senior executive for the firm’s DE business. “What was once considered a science project is now a necessity, and our continued military superiority depends on the outcome.”

### WHAT IS DIRECTED ENERGY?

DE weapons transmit beams or fields of concentrated electromagnetic energy at a target. There are two basic categories of DE weapons, high-energy laser (HEL) and high-powered microwaves (HPM). And each have different potential applications.

HELs can cause physical damage to targets like small boats, munitions, or drones from the ground or from the air, according to Joe Shepherd, who is the director of Booz Allen’s DE business.

“The same technology can be used to track, illuminate, and ‘dazzle,’ causing a temporary loss of sensor capability in a cloak of brilliant light,” he adds.

Alternatively, HPM uses high-powered radio frequency energy to disrupt a target, depositing electrical pulses or heat to cause an adverse effect. It can be used to disable vehicles and vessels and in counter-infrastructure operations by shutting down electronics. While usually less physically destructive than a high-energy laser shot, HPM weapons can give warfighters a tactical edge by eliminating the enemy’s ability to use critical equipment and offering non-lethal engagement to deescalate conflict.

### TURNING THE DIAL

One of the most compelling advantages of DE over kinetic weapons is seen in the cost-per-shot. For DE, this is primarily the cost of generating the power required to generate the beam and propagate it to the target.

“With DE, you’re talking a few dollars per shot compared to tens of thousands per shot for a kinetic weapon,” says Joe. “And you don’t have to carry gunpowder or bullets with you to reload.”

Beyond cost advantages, DE weapons offer the ability to “turn the dial” on lethality. In many instances, a military operator may simply want to disable an approaching target, rather than destroy it—a capability that DE, in many applications, can perform.

“We don’t think of DE as a replacement for conventional weapons, but as a complement. Incorporating DE can reduce cost and collateral damage,” says Booz Allen’s Patrick Shannon, who is focused on business development and acquisition for DE.

### TECHNICAL CHALLENGES

Because lasers allow for pinpoint accuracy in targeting, he says, they can greatly limit collateral damage when engaging a target. And since the energy travels at the speed of light, a target cannot evade an accurately aimed HEL beam. Moreover, DE can be difficult or impossible to detect.

Operators can use HPM against electronic targets without the enemy ever being able to determine the source of the damage.

Yet, for all these potential benefits, developing DE weapons isn’t without technical challenges. Current DE technologies require packaging that is large, heavy, and requires significant amounts of power to fire.





Much of the physics for DE are reasonably understood, and there's been significant progress in technology maturation. But the hardest part is packaging for the best possible practical and operational use.

### CHALLENGE ACCEPTED

Today, Booz Allen engineers, scientists, and operations specialists are working to address these challenges for the Navy. This team, which is primarily based at the Naval Surface Warfare Center Dahlgren Division in Dahlgren, Virginia, performs research, analyzes missions and engagements, conducts effects testing, develops and deploys prototypes, and implements proofs-of-concept that are integrated on ships and other platforms.

Beyond the technical challenges of building and installing a prototype like the Laser Weapon System for the Navy, we're thinking through the many military operational matters surrounding DE. We're helping the DoD understand how to integrate, deploy, and operate these weapons within its warfighter doctrine, in addition to building them.

### THE LEADERSHIP IMPERATIVE

Given their technical challenges and the need for a holistic framework in order to use them, widespread operational deployment of DE weapons is still years away. In the meantime, Booz Allen is focused on helping the DoD develop and mature the technology and understand how to deploy it efficiently and effectively.

"We have an imperative to help our clients achieve their missions. Because of our broad-reaching technical expertise in DE, we have the ability to move this technology forward," says Joe. "This includes helping our clients with technology maturation and prototyping. And internally, we are pursuing opportunities to develop relevant technology to help advance the acceptance of DE as a viable capability."

Adds Trey: "Directed energy is an inevitability; the question is not if it will be, but if it will be for us or for our adversaries. We are fighting tomorrow's wars today in our labs and on our test sites, and our present-day investment in directed energy will determine our ability to maintain military superiority in the future."

## TRANSFORMING AIR FORCE OPERATIONS

A 'DREAM PROJECT' MEANS DRIVING  
CHANGE ACROSS THE ENTIRE AIR FORCE

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*Scott Sadlon understands the meaning of transformation. He has to, as he's Booz Allen Hamilton's program manager for the Air Force Office of Business Transformation work, an impressively far-reaching contract that hits some of the biggest organizational problems facing the service branch.*



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**“These are hard, complex problems—enterprise challenges. The Air Force turned to us, and we’re bringing them the resources and solutions they need.”**

—Program Lead Frank Lee

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“We’re leading with confidence and changing the way the Air Force thinks about operating in a resource constrained environment,” Scott says. “Transformation is a must, as the Air Force, like each of the other military service branches, is being asked to do more with less.”

Through work spanning nearly 4 years, Booz Allen is tackling challenges that range from identifying gaps in care provided to airmen with post traumatic stress to redesigning the budgeting execution process using tools such as targeted facilitation, continuous process improvement, change management, organization design, performance management, and training.

For Booz Allen Senior Transformation Lead, Charlie Miller, the program represents “a dream project for a management consultant.” According to Charlie, “Business transformation isn’t easy, but we’re developing solutions to critical problems across the entire force, and having real impact on our client organizations.”



### TEAMWORK CULTURE

For Vice President and Program Lead Frank Lee, the idea of solving problems for a living is what first brought him to Booz Allen.

“These are hard, complex problems— enterprise challenges,” says Frank. “The Air Force is turning to us, and we’re bringing them the resources and experience to drive the solutions they need.”

It takes many different skill sets, and lots of teamwork, to make the Air Force’s day-to-day operations run smoothly. It also helps that reach-back expertise is only a click or a phone call away—even if that person needs to have achieved the highest certification level in a well-known program designed to extract waste from business processes.

At one point, “the Air Force called us asking for a Lean Six Sigma Black Belt with nuclear experience,” says Frank, describing a profile that’s rare even in Lean Six Sigma circles. “In less than 48 hours we had someone at the Pentagon in meetings with the clients.”

The transformation project also includes some work with the Air Force Review Boards Agency—something our employees find especially inspiring.

“It’s an organization that helps America’s heroes get the benefits they deserve more quickly—months sooner in several cases,” says Scott. “It is one thing to be saying, ‘We’re helping the agency save money by doing this,’ but when our work helps someone who needs a certain service, that’s extremely rewarding.”

## RECRUITMENT AND RETENTION

In order for the Air Force to meet and exceed its mission objectives, it must attract and retain the best and brightest.

Booz Allen is helping—by going into the squadrons, where most airmen grow up—to get a pulse check, asking for personal opinions on what could improve their Air Force experience. That feedback will lay the groundwork for future enlistees, officers, and civilians—it has a total force impact.

To attract the kind of personnel they need, Air Force leadership must adapt—and Booz Allen is helping by communicating the needs of today’s airmen.

What do they want? It could be anything from offering off-base activities to evolving communication methods. This often means finding ways to integrate mobile technology and new media.

“Younger generations are wired differently. What worked 30 years ago isn’t going to work today,” Scott adds.

## EMBRACING THE MISSION

“The Booz Allen team’s support has been phenomenal,” says Frank. “Since these are such critical Air Force missions—and of such significance—there’s an extra level of passion. We’re really trying to help the client make smart budget decisions, create solutions to advance their priorities, and apply best practices.”

This collective effort has a potential cost avoidance in the range of hundreds of millions of dollars, ultimately allowing Air Force leadership the ability to more strategically allocate funds.

Most importantly, the client is happy, describing our support as “trusted and instrumental.” And there’s an important business component, too—by working with new entities within the Air Force, we’re continuing to demonstrate that our mission and their mission are one in the same.

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**“Younger generations are wired differently. What worked 30 years ago isn’t going to work today.”**

—Program Manager  
Scott Sadlon



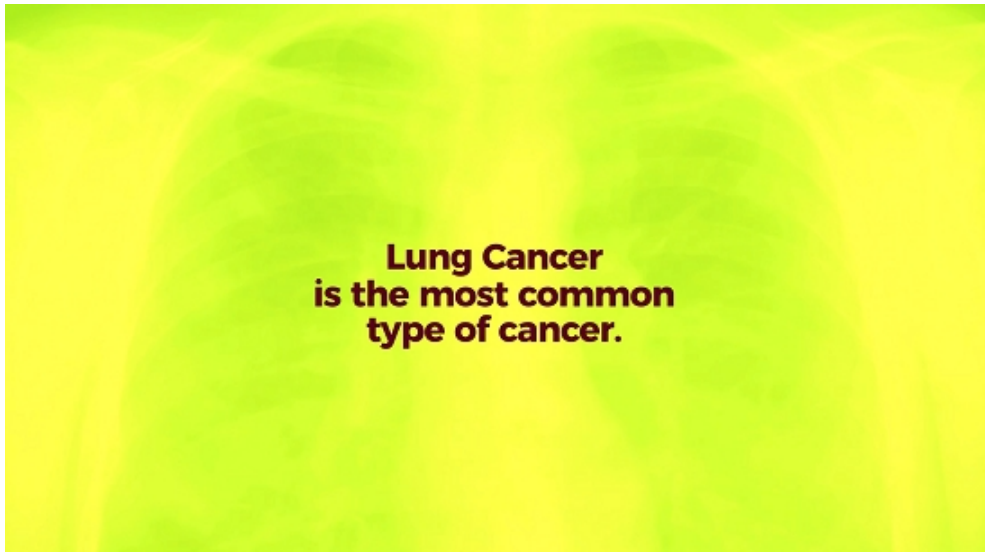
## DATA SCIENCE FOR SOCIAL GOOD BRINGS HOPE

HOW WE'RE USING DATA  
ANALYSIS AND APTITUDE TO FIX  
THE WORLD'S BIGGEST PROBLEMS

*It's Saturday, and Staff Technologist Connie Fan and a group of her fellow data scientists and mathematicians are spending their day off huddled in a conference room to combat human trafficking—with math.*

“This is something I really care about,” she says. “And it’s an opportunity to use a quantitative approach to a problem that is so purely human-based. “It’s hard sometimes too for people to see how numbers can help.

At the Human Trafficking Hackathon, they do.



### COMBATING HUMAN SLAVERY

There are at least 20 million sex slaves in the world, mostly women and children. Booz Allen Hamilton teamed up with not-for-profit **Polaris** to disrupt human trafficking networks by using data on illicit massage businesses to find and stop traffickers.

Connie and the other hackathon participants were able to reliably predict whether massage businesses were illicit or legitimate based on registered business names. And by automating the collection of data sources and building a risk identification algorithm, data scientists tracked usernames shared on other social networks or forums to help identify more illicit businesses in the future.

Together, Booz Allen and **Polaris** worked to better automate the mapping process, take on bigger cities containing hundreds—even thousands—of massage businesses, and train the model for wider circulation. Polaris had manually mapped 35 businesses; the algorithm was able identify 900.

Several states have adopted the mapping tool for use among law enforcement.

“In the movies, where there’s a guy putting pushpins into a bulletin board and connecting the dots with yarn, it’s like that, but in our computers,” Connie says. “I’m making a difference for these women and children by doing what I’m good at—math.”

### TACKLING INTRACTABLE PROBLEMS

Hundreds of Booz Allen employees have dedicated thousands of hours to contribute to solving major societal issues like human trafficking, including state-sponsored genocide and heart disease. It’s part of what we call “Data Science for Social Good,” and it’s one way we using technology and innovation for social impact.

“There are big, complex, hairy problems out there in the world, and data science is a great tool to

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**“In the movies, where there’s a guy putting pushpins into a bulletin board and connecting the dots with yarn, it’s like that, but in our computers. I’m making a difference for these women and children by doing what I’m good at—math.”**

—Staff Technologist Connie Fan

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break down those problems,” says Booz Allen Senior Vice President Mark Jacobsohn, known as Jake. “If we don’t dive in and help, these issues will continue to be intractable. There’s a lot of good that data science can accomplish.”

Our Data Science for Social Good program spans nearly a dozen projects that take us out of the office and off the clock. From hackathons to high-stakes academic games, here are a few of the ways we’re giving back—while pushing the science of data forward.

### PREDICTING MASS KILLINGS

Our data-hacktivists signed up to fight another global shame: genocide. **The Early Warning Project**, an initiative of the **United States Holocaust Memorial Museum**, aims to assess a country’s level of risk for mass killings. The museum asked us to validate its data analysis approach, and explore new ones.

The museum’s researchers can now do more than just monitor ongoing state-sponsored violence. The algorithms developed during the hackathon predict where this kind of violence is most likely to occur 1-2 years into the future, to gauge the potential for mass atrocities around the world.

### DATA SCIENCE BOWL

The data science we practice can also improve global health. We present the **Data Science Bowl**, in partnership with **Kaggle**. Each year the international event catalyzes the worldwide data science community around a societal challenge.

“The Data Science Bowl strives to accomplish what more than one individual, one organization, or one industry can accomplish alone,” says Dr. Lauren Neal, a senior data scientist and machine intelligence strategist. “The communities we convene are bringing about positive change in the world—working together to solve serious problems that affect millions of people.”

In its first 2 years, more than 1,800 teams participated in the Data Science Bowl, creating more than 22,000 submissions. In 2015–2016, we looked at how to more accurately diagnose heart disease. The winners provided cardiologists with an objective diagnostic model that eliminates measurement bias.

Now, the National Institutes of Health is in the early stages of testing and disseminating the findings.

The 2017 Data Science Bowl joined the fight against lung cancer by helping accelerate early detection. We’re grateful for the many sponsors who stepped forward with in-kind contributions of services and technology. In addition, this year’s competition had one of the largest cash prizes ever: \$1 million, provided by the **Laura and John Arnold Foundation**. Read all about the winners [here](#).



With our Data Science for Social Good program—which covers a dozen efforts in all—we get back as much as we give. Our data scientists and analysts gain valuable experience working these complex efforts to help prevent genocide, stop human trafficking, and transforming how we diagnose heart failure and lung cancer. It’s about empowering and igniting the passion of talent across our firm to creatively solve the world’s most painful problems. We believe that data science can bring positive change, and give a voice to those who can’t speak for themselves. We’ve seen it done. And there’s so much more to do.

“We know there’s a lot more than just money at stake here. For us, it’s an opportunity to use our skills to help save lives,” says Jake. “It’s not just a bolted-on thing. It’s part of who we are as a firm.”

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**It’s about empowering and igniting the passion of talent across our firm to creatively solve the world’s most painful problems. We believe that data science can bring positive change, and give a voice to those who can’t speak for themselves.**





## **BUILDING TOMORROW'S CYBER DEFENSE TODAY**

DESIGNING AN AGILE,  
INTEGRATED FUTURE-STATE  
CYBERSECURITY PROGRAM

*Booz Allen senior  
lead technologist Andrea*

When Will Farrell, Booz Allen Hamilton's Dark Labs director talks about setting a mousetrap, cheese is not the bait.

Instead, Will and his elite team use fake computers in a phony network, intentionally built to be vulnerable. The main goal of this virtual mousetrap is to lure cyber adversaries, who find it nearly impossible to resist hacking into those fake machines.

This approach to building a better defense is the creative strategy Will and his team at Booz Allen's Dark Labs deploy to protect vulnerable systems.

Many companies look inward in designing cybersecurity programs, building bigger fences and buying more bells and whistles to secure their perimeter. But inevitably, adversaries will find a way in.

"Instead of looking from the inside out, we look from the outside in. We pretend to be the bad guys," says Will. "You've got to think like the adversary to beat them."

### LOOKING INTO A CRYSTAL BALL

It's just that kind of strategic thinking that a major oil and gas company was looking for when its chief information security officer (CISO) asked Booz Allen to reevaluate the company's cybersecurity program.

But there was a catch. The CISO didn't want the team to even look at the company's current cyber state to start. Instead, he asked them one overarching question: What should the company's cybersecurity program look like in 5 years?

"We were literally going off almost nothing. The CISO didn't want us to be clouded by their current program," says Booz Allen's Deputy Project Manager Gary Barnabo. "We had a totally blank slate to offer a fresh view."

This global company is transforming from an oil company to an integrated energy company. And its value chain is vast—everything from exploratory drilling and extraction, refineries, and pipelines, to transportation fleets and gas stations.

Booz Allen Project Manager Matt Doan, never underestimated the task at hand. "We knew we'd need to do some pretty creative thinking, but make sure it was grounded in defensible frameworks and logic," says Matt.

### BRAINSTORMING A FUTURE CYBER THREAT OUTLOOK

In free-flowing sessions, the team of business and cyber strategists, threat intelligence specialists, hackers, reverse engineers, and industrial control systems experts brought bold thinking to this future challenge, conjuring up a comprehensive vision for the year 2022.



*Above: Booz Allen cyber consultant Alexandra*

They outlined technological, geopolitical, economic, and other global forces causing business and cyber change. And they forecasted the resulting cyber challenges, such as relentless cost pressures and the overwhelming diversity of Internet of Things technologies permeating every part of the organization.

The ultimate goal? Package the ideas into a compelling blueprint of a future-state cyber program to one that would set the vision for the capabilities and operating model needed to address cyber risk 5 years down the road.

### THINKING LIKE THE ADVERSARY

The team looked at a full spectrum of anticipated threat actors and capabilities. Nation-states could attack critical infrastructure and cause physical harm, for example. Criminal organizations could use ransomware to affect oil production along the supply chain. And hackers could attack email servers and cost the

company hundreds of millions of dollars.

Two clear vulnerabilities emerged. One was the IT environment. As the company rapidly moves more business processes into a third-party cloud environment, it leaves their data and applications in a more uncertain—and potentially exposed—state.

The other challenge: the company's operational technology environment. Countless motor controls, switches, conveyor belt valves, pressure centers,

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**“Instead of looking from the inside out, we look from the outside in. We pretend to be the bad guys, You’ve got to think like the adversary to beat them.”**

—Booz Allen Dark Labs Director  
Will Farrell

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Booz Allen cyber analysts  
Meredith and JC

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**“We demonstrated how to blend art and science into a future-looking masterpiece. We showed them how their security professionals could complement and amplify the impact of their security tools and technologies to enable the business.”**

—Booz Allen Project Manager  
Matt Doan

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pumps, and turbines make up the physical equipment involved in extracting and producing oil—and much of it is not monitored or secured.

To protect these two different domains, our team brainstormed a wide range of plausible cyber incident scenarios to determine the right types of security measures to implement for the future. In a series of mind-mapping exercises, they “connected the dots” on how machine learning and deception technology might play a valuable role in those virtual mousetraps.

They considered the rapid growth of attack techniques and, how current methods of identifying attacks will likely become obsolete. And they simulated “hunting,” a technique to detect hard-to-find threat activity hiding within the “black spots” of a network.

“Hackers don’t look for the hard way in. They’re looking for the low-hanging fruit,” says Will. “Our goal is to defend, mitigate, and increase the level of effort for an adversary. We want to make it hard enough for hackers that they decide to go someplace else.”

#### **MAPPING A COURSE FOR THE FUTURE**


After several months, the team delivered their program blueprint and an implementation plan. Only then did the CISO let them review the current program so they could understand gaps and chart a course to the future state.

What they found was a program that was “siloes and piecemeal,” says Matt. “They can’t move quickly enough to adapt to new risks.”

The future-state program, on the other hand, is designed to be agile, with a highly integrated operating model in which a distributed network of teams is empowered to work fast in their own environments, but still be highly linked to one another and operate with shared purpose.

Based on Booz Allen’s recommendations, the company is making its forward-reaching cyber program come to life.

“We demonstrated how to blend art and science into a future-looking masterpiece,” says Matt. “We showed them how their security professionals could complement and amplify the impact of their security tools and technologies to enable the business.”



**MAKING  
USASPENDING.GOV  
AGILE AND OPEN SOURCE**

RADICAL 'OPEN DISRUPTION'  
APPROACH BRINGS THE DATA ACT TO  
LIFE

*Booz Allen employees: information operations  
portfolio manager Hiba, and cyber products  
program manager Lacy*

Lead Scientist and UX Researcher April Osajima is talking to tourists at the U.S. Capitol Visitor Center.

She needs their opinions on a website that, once live, will do something unprecedented— enable anyone with an Internet connection to gain visibility into federal spending, starting with annual totals and zooming in to see dollar amounts for each sector, each program, each city, each contract.

Booz Allen Hamilton, teaming with Kearney & Company, is building it for the U.S. Department of Treasury as part of its effort to implement the 2014 Digital Accountability and Transparency Act (DATA Act), designed to give Americans a clearer understanding of how their tax dollars are spent.

As breakfast turns to lunch, April spends a few hours opening up her laptop for a friendly slice of outside-the-Beltway citizenry, in compliance with federal regulations governing research procedures. All she has to show people at this point is a mockup of the homepage, USAspending.gov, but it's enough to elicit reactions that will change the course of the site's design.

Her trips to the Capitol are just one part of our trailblazing approach to the DATA Act's implementation. We're calling it Open Disruption, and with open-source code, continuous delivery, and an Agile design methodology, it's almost as radical as the total spending transparency that the DATA Act aims to achieve.

### DIFFERENT FROM BEGINNING TO END

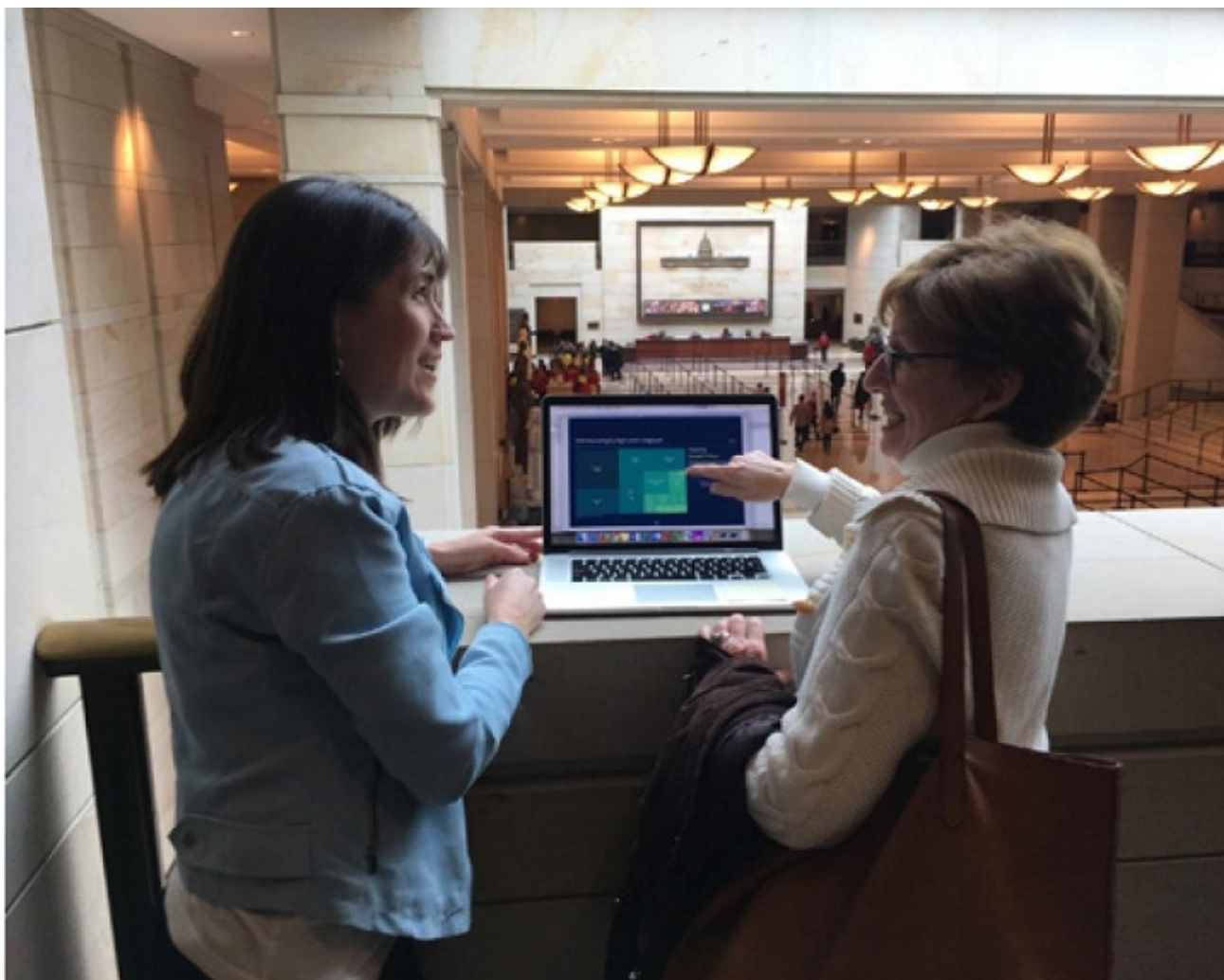
Traditionally, .gov site-builds have adhered to a sequential design process known as the waterfall method. It dictates that, before a single line of code is written, developers and stakeholders must co-author and sign a beefy set of requirements that describes the exact form the final product will take, and the exact process by which it will come together. It's then built, exactly as specified.

If, somewhere along the way, a better path to accomplishing the project's goals suggests itself, too bad. The requirements, once approved, cannot be altered.

The Agile methodology we're using to implement the DATA Act looks different from beginning to end.

First, instead of defining a set of rigid requirements upfront, the Booz Allen team worked with Treasury and representatives from more than 25 federal agencies to establish the core functionalities the final product needed to have, according to Booz Allen Project Manager Drew Leety.

"The focus is more on making sure the site offers the functionality it's supposed to and less on the process that drives how we get there," Drew says.



*Booz Allen UX designer April chats with an end user*

Accustomed to having all of their questions answered up front, some stakeholders were nervous about this approach. The second step in the Agile process eased their concerns.

"We brought user acceptance testing in at month two," says Drew.

This means that, at a point when a waterfall team would still be gathering requirements, we unveiled a bare-bones prototype that our agency partners could sit down and use. Skeptics became believers when they saw that their top priorities were already being realized.



"We picked certain features that we knew they would want and got those built," Drew says

Next came Agile's primary stage: continuous delivery brought about by two-week sprint cycles. While April and our other user experience (UX) researchers gathered agency feedback on the prototype, our developers spent 14 days readying a second release with additional capabilities.

Then, while prototype 2 was put through the ringer, we incorporated lessons from the first round of tests into a 3rd-stage version, and so on.

"It's almost like real-time requirements and developing going on together," says Drew.

## ON-TIME OPEN DISRUPTION DELIVERY

The first capability we developed and tested by our agile method is called the DATA Act Broker. Using a TurboTax-style automated wizard, it's currently helping agency financial officers standardize their spending data and upload it to the cloud for the public to access.

A similar waterfall method project took more than 4 years to create and is still going through additional required development to accomplish its goals. We launched the Broker in just 6 months, and it's exceeding expectations.

Throughout the implementation, we've maintained a level of transparency that's nearly unheard of in the government IT realm. For example:

- **GitHub** is used to share processes and workstreams
- **JIRA**, our agile project management tool, is publicly accessible, allowing anyone a near real-time look into our current sprint cycle
- Code is shared on **code.gov**, where people from all over the world can play around with it and identify possible improvements.

And we held a hackathon at our **DC Innovation Center**, inviting coders and data scientists to propose and test new and better ways to analyze and visualize the spending information that's come in through the Broker.




## A MODEL FOR THE FUTURE

By combining radical transparency, Agile workflows, and continuous delivery, we're on track to achieve the DATA Act implementation's goals on schedule, and in a way that incorporates ongoing feedback from over two dozen agencies and the general public. We're giving interested Americans a better understanding of federal spending than they've ever had before, and demonstrating that agile development principles can be successfully applied to projects that span nearly the entire government.

This is the model for how government IT work can and should be done in the future. For now it's called Open Disruption. Someday, it may just be the norm.





**ACHIEVING SOFTWARE'S  
HIGHEST QUALITY RATING**

NEW 'MATURITY LEVEL' SHOWS WE  
CAN DELIVER ON THE MOST COMPLEX  
PROJECTS

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*Booz Allen 3-D modeler Sommer*



Lead Engineer Shannon Campbell is an engaging game show host, as she gets ready for the next round of Booz Allen Hamilton's own "Jeopardy!"-style quiz show. The goal? To help teams get comfortable with statistics and process improvement techniques.

In July 2015, Booz Allen had been awarded a \$200 million contract with the Centers for Medicare and Medicaid Services (CMS). And the agency required that the firm's Systems Delivery Execution organization achieve a higher "maturity level" (ML) rating for software development and quality management from the Capability Maturity Model Integration Institute (CMMI) within a year—or forfeit a portion of the contract.

The process toward higher maturity typically takes 2 years. But because of the CMS contract, we had to get there in half the time.

"Change doesn't come easily. Just telling someone to do something doesn't work," says Shannon, a process improvement expert. "You have to make it fun and interesting, too. Who doesn't love a little friendly competition?"

### A CULTURAL SHIFT

For more than 20 years, we've used CMMI models, and we've operated consistently at ML 3 since 2005. We could point to our solid foundation—an industry-leading team of data scientists, a robust modeling and simulation capability, and a proven software delivery track record.

But to become a truly data-driven organization meant not just using advanced statistical processes in ongoing projects. It also means proving it—showing and telling how we use data to gauge performance and predict results.

"To be certified at maturity level 4 or 5, we had to start being proactive, instead of reactive, with our data," says Kevin Schaaff, team lead and Booz Allen's CMMI high maturity appraiser. "It's a real culture shift for any organization, and ours was no exception."

### SETTING THE BAR HIGH

Kevin and his team moved into overdrive. They identified existing client projects that Booz Allen could move to high maturity. Each project brought a unique element to the table:

- For an Internal Revenue Service client, we had over 10 years of data following a consistent repeatable process.
- At the Department of Veterans Affairs, and in support of the Marine Corps, our software development teams used Agile methods, with rapid cycle times to generate data very quickly.
- And at CMS, our people were working on a systems integration project that collects thousands of data points every day.

Together, the projects highlighted the breadth of our software engineering, analytical, and quantitative management expertise.

"We set the bar very high," says Lead Technologist Ryan Bays, a process improvement expert. "We knew it was going to be hard. We had to be brutally honest and expose our software development weaknesses in front of everybody. That was the only way to reach our high maturity goal."

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**In July 2016, the firm's Systems Delivery Execution organization was appraised at CMMI ML 5, making Booz Allen one of only 11 Fortune 500 companies to achieve this rating.**

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### RISING TO THE CHALLENGE

While each project was different, the people challenge was the same. There was a steep learning curve—some team members had very little understanding of data analytics. In a short time frame, employees needed to learn to use advanced techniques, and feed collective lessons learned and process improvement recommendations back to support the firm's efforts to optimize processes.

In addition to the "Jeopardy!"-inspired games, Kevin and his team developed innovative training, tools, and mentoring to help people learn statistical concepts. In our *Analytical Techniques Workbook*, for example, users could find the most popular and useful data techniques, so they didn't have to figure it out on their own.

Ultimately, team members had to become so conversant in quantitative management that the tools and techniques would become just another part of doing business.

### **A QUANTUM LEAP FOR OUR CLIENTS AND OUR PEOPLE**

To achieve the maximum possible client benefit, we set our sights on ML5, the highest industry benchmark for software quality. As a result, we were able to enhance clients' processes, delivering on specific quality and process improvement objectives to improve the overall quality of work for our clients' products. We were now using data to look forward and predict, rather than simply reporting our results.

In July 2016, the firm's Systems Delivery Execution organization was appraised at CMMI ML 5, making Booz Allen one of only 11 Fortune 500 companies to achieve this rating.

"It's a quantum leap for us and our clients," says Kevin. "It's powerful to be able to see all the pitfalls in near real time when you tweak a specific process. To be able to predict is powerful."

## ATTRACTING MORE WOMEN TO STEM CAREERS

FIND OUT HOW WE'RE  
INSPIRING, CONNECTING, AND  
PAVING THE WAY FOR WOMEN  
IN STEM CAREERS

*Booz Allen director and  
engineer Velma*



There was a time when Booz Allen Hamilton's Cheryl Wade thought engineers drove trains.

"I didn't know how to apply my love for math," explains Cheryl, who was introduced to engineering through a community youth science and engineering program. It would become her college major—and later her career.

Women and minorities remain vastly underrepresented in science, technology, engineering, and mathematics (STEM) fields. Take cybersecurity: According to a **study** by the International Information System Security Certification Consortium, women make up only 11 percent of the global cybersecurity workforce.

Booz Allen is committed to increasing the number of women in STEM—through awareness, outreach, and advocacy.



## EARLY INSPIRATION

Cheryl is passionate about addressing the opt-out points for those interested in STEM-related careers, starting with early inspiration. As co-creator of our STEM Girls 4 Social Good initiative (**SG4SG**), a movement of Booz Allen women working to strip away the perception that girls lack an affinity for math, science, and technology, she knows that confidence is everything—especially for young women.

"If you don't have the support system, or role models at home it impacts your confidence and your ability to see yourself as successful in this space," Cheryl says. "You can't aspire to what you haven't seen."

In partnership with the **DC chapter** of not-for-profit **Girls Inc.**, the week-long SG4SG initiative pairs high school girls with Booz Allen professionals and summer interns. This exposes young women to STEM careers, while providing vital interaction.

Everyone works together to solve a social challenge. Two years ago, teams tackled human trafficking using data analytics. Last year's focus was food deserts in urban areas.

Call it a movement of collective ingenuity—and it's working. Girls are excited about the endless possibilities STEM opens up. One family wrote to Cheryl to share that their daughter won't stop talking about STEM after participating in SG4SG, and has a new interest in robotics.

## OPENING DOORS

SG4SG is only part of a larger movement at Booz Allen focused on opening doors for women in STEM.

For the past 2 years, our Women's Forum has sponsored **Girls in Technology**, a DC-area not-for-profit. Tech demos, women in leadership, and diversity are the heart of the initiative. "This is an opportunity to get hands-on with the latest and greatest technology in an all-girls environment and is an example of women supporting women," explains Jenny Oh, Forum co-chair.

It doesn't stop there.

In February, we sponsored screenings of the Oscar-winning film *Hidden Figures* at theaters around the country. Employees were empowered to think about diversity, to start conversations around inclusion.

A month-long series of profiles featuring our own brilliant women—from computer programmers and project managers to engineers and web designers—followed, touching on themes of ensuring equality for women and minorities in the workplace, and the challenges women face every day in boardrooms across America.

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**"When you walk through a door, leave it open for the next woman to walk through."**

—Teneika Askew

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Associate Sharon Johnson works as a cybersecurity engineering lead for the U.S. Naval Surface Warfare Center. Her take: determined is not a synonym for domineering.

"When a woman is strong-willed and decisive it can sometimes be perceived as bossy or aggressive, and that's not fair," Sharon says.



At Booz Allen, we have a history of supporting women in the workplace. Every day, we talk about how diversity—of background, experience, and thought—is essential to maintaining the excellence of the work we do. As a leader in the information technology field and a top employer of STEM talent, we're committed to increasing the number of women in STEM careers.

For us, that means focusing on recruiting the best and brightest women in their fields and addressing policies needed to attract and retain talented women. We provide comprehensive career support, from mentoring opportunities to professional development, to help women continue to build their skillsets.

Our focus on supporting women contributes to innovative ideas and pioneering solutions, and drives better results—not only for our clients, but for the world around us.

And when it comes to making connections, actions speak volumes, too.

Booz Allen's Teneika Askew, who currently focuses on data analytics for the U.S. Navy, perfectly sums up the need for equal representation of women in STEM-related fields. She cites the necessity of mentorship and fostering a connection. "When you walk through a door, leave it open for the next woman to walk through."



*Participants from the STEM Girls for Social Good summer program*



### 3 WAYS TO ETHICALLY INNOVATE IN MACHINE INTELLIGENCE

WHAT ARE THE CONSEQUENCES  
WHEN MACHINES CAN MAKE  
DECISIONS, AND HOW DO YOU  
PREPARE FOR IT?

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**At Booz Allen, we're laying out a future where advancements in machine intelligence are shaped by a set of guiding principles borrowed from human subject research—beneficence, justice, and respect. We want to ensure that MI is beneficial, not harmful, to human welfare.**

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Every day, machine intelligence (MI) gets closer to making fantasy reality. Innovations in machine learning, high-performance computing, and more advanced computer reasoning are powering breakthroughs in health and science, helping airlines run more efficiently, and assembling new defensive capabilities to deter security threats at home and abroad.

But we are also rapidly approaching a future where machine intelligence will be used to suggest whether you're stopped by police, whether you're hired for a job, the mortgage loan rate you're offered, or whether you're admitted to the school of your choice—decisions with real consequences if the tool contains errors or unintended bias. This future reality raises serious ethical and policy concerns that must be addressed head-on.

At Booz Allen Hamilton, we're laying out a future where advancements in machine intelligence are shaped by a set of guiding principles borrowed from human subject research—beneficence, justice, and respect. We want to ensure that MI is beneficial, not harmful, to human welfare.

This was the focus of our response to a request for information issued by the White House in June 2016 for the pros, cons and other implications of machine intelligence. We are calling for an approach where ethics are not simply tacked on at the end, but rather drive the U.S. approach to this experimental new technology.

We see that with the work being done to drive technical development and research for our evolving **machine intelligence** capability, work that includes machine learning and deep learning, quantum computing, and more. We believe the potential positive applications for machine intelligence far outweigh the threats, and by beginning with ethics and safety engineering in mind.

"There's a huge influx of technology," says **Booz Allen Senior Vice President Young Bang**. "We're just touching the tip of iceberg. How things can be automated and ultimately make life easier for regular people as well as the government, it's an exciting time for that. But again, there is an ethical dimension to the decisions we need to make. So, instead of pushing, 'Here are the cool things we can do,' which we can, we're pushing ethics associated with artificial intelligence. Thinking about things differently that way—that's what I'm really excited about."

Adam Porter-Price, a leader in Booz Allen's machine intelligence work, and his team have some concrete steps to share on just how to ethically innovate in the field.

### TEST MODELS EXTENSIVELY

You should review with a diverse group: Technologists should seek opinions from a broad community of technical and business or internal professional users to avoid making an embarrassing or dangerous misapplication of machine intelligence tools. And consider piloting an "inert mode," running MI tools in pilots parallel to the production environment to compare the results against a human-operated process.

### INSTITUTE BOUNDARIES

Define easy-to-understand categories of data that are always unacceptable to use. It's nearly always unacceptable, for example, to include personal health information in a predictive model. This will let both business and technical leaders debate variables using a common language.

### ESTABLISH A GOVERNANCE PROCESS

Create a mechanism for overseeing the application of MI tools at the executive level, incorporating review by senior business and technology leaders to oversee privacy, security, ethics, assumptions, input data, and operations issues. This group should constantly review results from MI initiatives and post-mortem pilot programs, and should help promote a common understanding of MI tools and concepts across the organization.

The ethics issues we've seen to date in MI have largely been caused by accidents and poor application of techniques, rather than deliberate actions. Doing these three things will substantially reduce the chance of mistakes, and will provide a mechanism for spreading this increasingly useful technology across your enterprise. Machines may be increasing in ability daily, but they will still need to work closely with ingenious humans to answer tough questions over the next century.



## WHAT DOES MI LOOK LIKE WHEN APPLIED?

*Here are some of our projects; this year promises to see even more activity, so stay tuned.*

### ART BY MACHINES

We taught a computer to paint Picasso style—and not just images, **actual live video**. Walking up to the Art Mirror is like falling into a painting, the style of which depends on the filter applied. The most popular is probably Van Gogh's *Starry Night*; when you look at yourself in the Mirror, you see your own image inside the world summoned by the artist's brush—blurry swirls and colors. As you move, you move as some kind of fantastic version of yourself living inside this great work of art. You can also capture an image to email to yourself later.

Our developers took a high-performance machine and told it to look at a series of images and paintings—some by famous artists—others general styles, and filters “learn” how to paint that way. It was computationally intensive to do that and took a couple of days of “machine learning” for the system to process all the data. The inspiration for Art Mirror was an open source project by Gene Kogan, an artist and programmer. Our developers kicked their customized code back to the GitHub community so that others can benefit and improve upon it.

### BEAT AWAKE

The idea was conceived at Booz Allen's Summer Games internship, by Michael Jacob, now a consultant, and André Nguyen, now a technologist. The Beat Awake technology pairs up to smart-watches and leverages biometric data to determine anomalies in heartrate, alerting the wearer of the watch when one occurs. The goal is to keep drivers from falling asleep at the wheel. We presented a mobile prototype for an inventive new product at the 2016 Amazon Web Services' re:Invent conference.

### TOPCODER'S TOPCODER OPEN

We worked with Topcoder, the largest crowdsourcing community in the world, to host the Topcoder Open at our own DC Innovation Center. This annual event brings together the best coders from across the globe to compete against one another in six different types of competition, including best algorithm, prototype, and user interface design. This year's Topcoder Open featured 62 competitors representing 26 countries. Six coders walked away winners. Find out who won and more at <http://tco16.topcoder.com/>.

## HELPING MILITARY KIDS SHINE THROUGH INNOVATION

AWARDS PROGRAM TACKLES  
COMMUNITY ISSUES, BUILDS  
NEXT GENERATION OF  
LEADERS





2017 Booz Allen Innovation Award  
Winner Sophie Bernstein

Lisa Sales loves her job. A Booz Allen Hamilton cybersecurity program manager and strategic communications consultant to defense and intel clients by day, she has a passion for applying her expertise to transform lives in her community. Most recently, that meant helping 17-year-old Elizabeth O'Brien, the first-ever winner of the Booz Allen Hamilton Innovation Award for Military Children, in her mission to meet the needs of children with disabilities in the military community.

"It's both empowering and humbling to know that I'm impacting the lives of military children with illness and disability through my advice and expertise," says Lisa. "I was proud to be part of the planning for the next phase of Elizabeth's mission and encourage a new generation of innovators."

#### WHAT MORE CAN WE BE DOING?

Elizabeth started volunteering at a young age. When she was 14, she noticed that some disabled kids at Fort Bragg didn't have accommodations at their base housing to meet their needs. Insurance didn't cover it and families couldn't afford it. With the help of Military Missions in Action (MMIA), she established the Military Child Access Assistance & Development Program (MCAADP)—at age 14—and created a 5K hike to raise funds to build accessibility ramps.

Elizabeth is just one of many military kids who create innovative solutions to address challenges in their communities. A stuffed bear that kids can hold while having an MRI to make the scans less scary, community gardens grown and harvested by kids and proceeds donated to shelters, solutions for the global water crisis—these ideas were conceived and put in motion by children from military families.

They have the vision and passion to not only see the problem, but do something about it. In late 2015 Booz Allen asked itself, "What more can we be doing to support military and veteran families?"

#### MATURITY AND RESILIENCY

Booz Allen demonstrates its thought leadership and passionate service by promoting sustainable military service through the physical, psychological, and emotional wellbeing of service members, veterans, and military families. We wanted to share our own innovation roadmap with the next generation.

Together with longtime not-for-profit partner Operation Homefront, we created the Booz Allen Hamilton Innovation Award for Military Children, to be given to a military child who has created an innovative community program or nonprofit. Our award is part of the larger Military Child of the Year (MCOY) Awards, an Operation Homefront program recognizing outstanding military children of all branches, as well as wounded warriors "demonstrating resiliency, leadership, and achievement."

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**"Winning the Booz Allen Innovation Award was one of the most amazing experiences of my life. It's nice to be recognized, but more importantly, because of this award, more children with disabilities will receive help and attention to their needs."**

— 2016 Booz Allen Innovation Award Winner Elizabeth O'Brien

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"Imagine it, children who sacrifice much as part of a military family—relocation, separation from loved ones—and still they show a maturity and resiliency beyond their ages in implementing innovative solutions to address the needs of their communities," says Booz Allen Executive Vice President Laurie Gallo, who is on the national board of Operation Homefront.

Most military children move eight times before they graduate high school. That means they rarely get opportunities to be recognized for their achievements or build a community of supporters for scholarships and other college-readiness opportunities.

"Booz Allen is committed to shining a spotlight on the creativity, commitment, and compassion of military families, and we thought a great way to do that is recognize the contributions they are making in their communities," Laurie adds.

#### SUPPORTING NEW MISSIONS

Booz Allen's Innovation Award is now a permanent part of the MCOY program. Nominees' projects are judged on impact, scalability and of course, innovation.

"Winning the Booz Allen Innovation Award was one of the most amazing experiences of my life," says Elizabeth, now an 18-year-old college student. "It's nice to be recognized, but more importantly, because of this award, more children with disabilities will receive help and attention to their needs."

As an Innovation Award winner, Elizabeth received a cash award, a trip to Booz Allen's Innovation Center in DC, and the support of a volunteer project team that helped her map out what's next for her program. The result is a unique, cross-sector effort to provide disabled military children with their own leadership, service, and social opportunities in the community.

Lisa led the team that helped Elizabeth: "We were proud to grow Elizabeth's mission to create safe, accessible, social-inclusion activities for children requiring special accommodations."

Seventeen-year-old Sophie Bernstein is the newest Innovation Award winner for her sustainable food program. Elizabeth hopes the Sophie has just as amazing an experience as she has had working with Booz Allen's people.

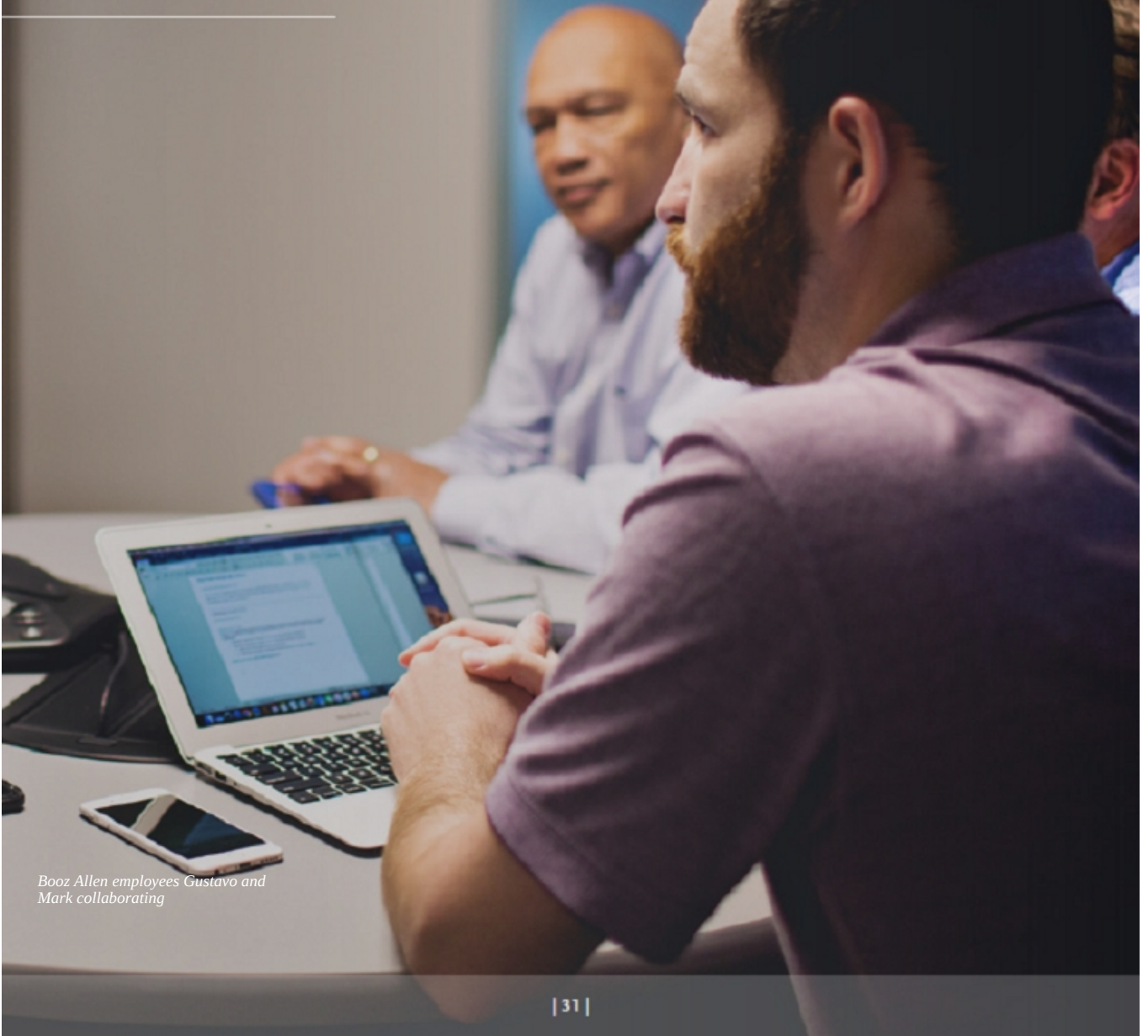
"I feel the love and support from everyone that has worked on the Innovation Award program and my project team," Elizabeth says. "They still check in on me, not only to talk about my program, but just to see how I'm doing in college. I love that."



## HACKATHONS EMBED PARTNERSHIPS INTO PROBLEM SOLVING

HACK INTO A NAVY SHIP?  
WE'RE TACKLING COOL  
PROBLEMS THROUGH  
COLLECTIVE  
BRAINPOWER.

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*Booz Allen employees Gustavo and Mark collaborating*



Three days, 50,000 square feet, 250 engineers, military officials, entrepreneurs, and designers, and one place—Austin's incubator, **Capital Factory**.

A team huddles together in a conference room with open laptops and portable whiteboards to start brainstorming ideas. The challenge? Hack into a U.S. Navy ship.

"Cool problems' is a term I heard a lot," says Associate Alison Jarris, one of the Booz Allen Hamilton hackathon organizers. "I think younger technologists weren't necessarily aware of some of the Navy's issues making software for its fleets more secure, and now that awareness is making them think about potential careers in Navy—sans the uniform."

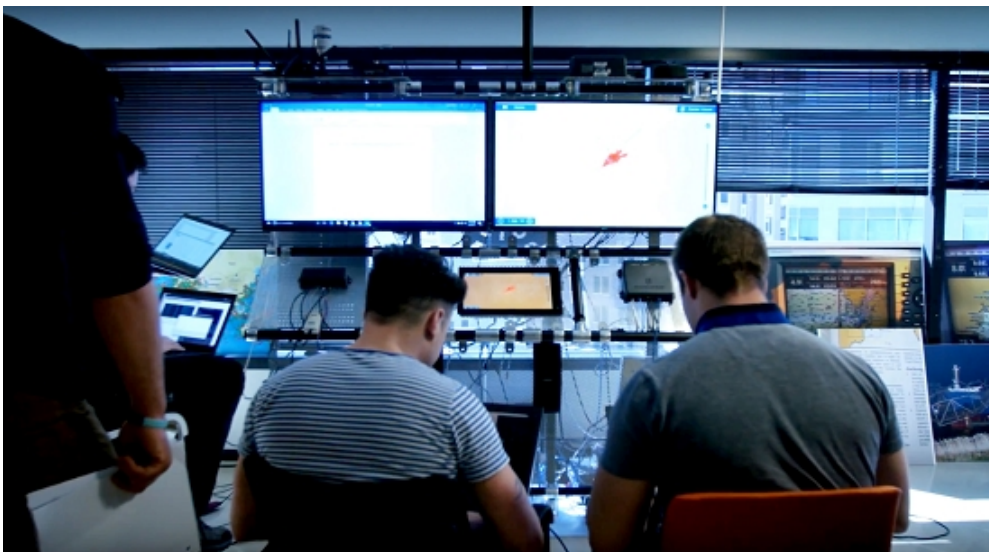
### HACKTHEMACHINE

**HackTheMachine**, a joint project executed by Booz Allen and the Naval Postgraduate School's Center for Cyber Warfare, put hackers to the test in February 2017. They were challenged to penetrate the security systems of U.S. Navy warships, to eventually create products that would improve cybersecurity measures on naval vessels.

This exercise put our embrace of collective ingenuity to the test.

"A single Navy operator controls multiple ships and if the system that controls the fleet were to be hacked, an array of damaging consequences could follow. That's a very real problem for the Navy, and they needed to bring together talent from military and the technology community to help find solutions," Alison says.

By the end of the event, hackers identified vulnerabilities in the custom-built boat-in-a-box simulator that criminals could potentially exploit.



### CUTTING ACROSS DISCIPLINES

So, what exactly is a hackathon?

A mashup of "hack" and "marathon," these events evoke a certain scene in our imaginations: college students huddled around laptops in dorm basements, spending days and nights coding and building new software.

Though not completely off base, “hackathon” is more broadly defined today. Technologists use the term to describe a number of different types of gatherings that vary in scope, size, and execution. But, for the most part they all contain an assortment of cross-discipline teams, a shared challenge, and an element of competition. Typically, that’s a cash prize, or a mechanism to scale prototypes.

What they do well is bring together professionals across skill sets to solve major problems. Think social problems like poverty and homelessness or even health obstacles such as electronic health records and policy for medical providers. And they aren’t solely the domain of hard-core techies.

“I assumed you had to be a developer or coder to participate,” says Associate Anastasiya Olds, talking about her first hackathon. “It was a collaboration between Booz Allen and the Holocaust Museum. I have a very functional systems delivery background but was able to contribute right away.”

### **PUTTING OUR SKILLS ON DISPLAY**

Booz Allen has been taking advantage of this model to allow employees a new avenue to showcase their skills while creating solutions for some weighty issues. Through the years, we’ve crossed private-public sector lines to collaborate on numerous other issues:

- Securely integrating new smart city technology solutions
- Predicting terror attacks using open source datasets and application program interfaces
- Improving and updating marine safety inspections technology across U.S. coastal ports
- Testing the security of Navy drones and ships against intense cyber attacks
- Combating PTSD with new brain health technologies
- Increasing awareness of cybersecurity needs in the bio-tech industry

What we’re doing with hackathons is embedding partnerships into problem-solving. With every one, the world gets a little smaller, and more people come together.

“We fully embrace our client’s missions. That means making client support as inclusive and collaborative as possible,” says Brian MacCarthy, head of Booz Allen’s San Francisco Strategic Innovation Hub. “We’ve made hackathons a key part of how we maintain that ideal.”

### **A MODEL FOR ENGAGING TOP TECH TALENT**

Back in Austin, 250 HackTheMachine participants take off their villain caps after an epic, 72-hour electronic assault on Booz Allen’s Boat-In-A-Box, a fully functional model of the networked systems that equip today’s connected maritime vessels.

Their 3 days of simulated evil-doing was exhausting but satisfying. It bore substantial fruit: 10 winning solutions that could potentially improve safety and efficiency of maritime cybersecurity, use data science to create safer oceans, and harness next generation design for position, navigation, and timing alternatives.

The U.S. Navy’s biggest win of the weekend, however, did not come from the HackTheMachine participants. It was the *number* of participants. A huge shortage in the current cyber workforce means that creatively engaging such a large number of tech industry and academic talents was a major win.

Is it possible to engage America’s young, innovative, willing-to-take-a-risk entrepreneurs in the mission of solving the government and military’s most difficult challenges?”

With HackTheMachine and other hackathons, Booz Allen has answered that question for the U.S. Navy and other clients looking to tap the tech community’s vital pool of talent.



## RISKCANVAS™ ROOTS OUT MONEY LAUNDERING

NEW TECHNOLOGY PLATFORM IS STOPPING DIRTY MONEY IN ITS TRACKS

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*Joe Gillespie, Booz Allen Hamilton's financial crimes program manager, recalls being invited to a meeting with some prospective banking clients. They needed help catching criminals—the kind that need to obscure the origins of their illicit profits and activities.*



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**“riskCanvas has cut false positives down by 50 percent and reduced wasted analyst time by 75 to 80 percent. All in all, this is delivering multimillion-dollar cost reduction for our customers.”**

—riskCanvas Product Manager  
Quinten Hout

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Thanks to key provisions of the Patriot Act, financial institutions are on the front lines of anti-money laundering efforts. It's a tough burden, but one that Booz Allen is making easier with a new suite of products called **riskCanvas™**.

When it comes to solving client's problems, we're ready to take on any challenge. And by combining our analytics expertise with an understanding of the regulations that financial institutions need to comply with—we were ready to help banks take money-launderers head-on.

### NOT A WEAPON, BUT A PRODUCT

Joe was used to tough challenges, having spent considerable time after 9/11 working for the Department of Defense and using his analytics skills to stop criminals. But this was different.

“The bank's leadership—they didn't want a weapon and they didn't want to hand over their data to us to track these criminals. They wanted to buy a product so they could do it themselves, better and more efficiently,” says Joe.

riskCanvas has gotten off on a strong start. Reports from our pilot launch with two clients—a large multinational bank and a capital markets broker dealer—have been very positive. These clients are meeting their anti-money laundering obligations more efficiently and reducing the costs of doing it.

### CATCHING THE CRIMINALS

What makes riskCanvas different is the data science and advanced analytics that goes into it. Many banks have large anti-money laundering programs to conduct investigations—sometimes thousands of analysts, but the problem is that their systems are generating greater than 99 percent false positives alerts and each one of those false positives has to be checked out by an analyst.

“That's a huge efficiency problem,” says Quinten Hout, Booz Allen's riskCanvas product manager, “both in human hours and costs, while the real criminals could get away undetected.”

By applying a propriety technology to search open-source data, riskCanvas is able to enrich the information that banks are already required to collect about their customers. It then goes through detailed analysis and generates something we call riskDNA™, and eventually everything known about a customer is distilled into a Risk Score.

Through riskCanvas' case management tool, which leverages Big Data technologies to aggregate large and disparate customer and transaction data, analysts are able to conduct their investigations more rapidly and conclusively than ever before.

“riskCanvas has cut false positives down by 50 percent,” says Quinten, “and reduced wasted analyst time by 75 to 80 percent. All in all, this is delivering multimillion-dollar cost reduction for our customers.”

And we have the time studies to back up that claim, adds Joe.

### BEING BOLD IN TRYING NEW THINGS

Booz Allen created a place for itself in the AML compliance market. When the firm first started attending AML conferences a couple of years ago, we were fairly unknown in this field, now, thanks to the bold thinking of our employees, we're the forerunners and thought leaders and have a top-ranked product.

“I'm proud of Booz Allen and the people that have come together to create this offering,” says Joe. “We're bold about creating better processes and that's exactly what the financial industry needed us to do. In 2 years, we've made quite an impact in compliance and are helping financial institutions realize that there's a better way.”

And let's not forget that in addition to the benefits financial institutions see from being able to meet their regulatory obligations better and more cost effectively, “We're saving lives,” Quinten says. “I believe that. By disrupting the ability of really bad people to move money and finance their operations, we're creating a safer society.”



**THE GRADUATES  
COMMUNITY LIGHTS  
THE WAY**

FORGING CONNECTIONS TO  
SENIOR LEADERSHIP POINTS  
THE WAY TO PROFESSIONAL  
SUCCESS

*It's 1987. Gary Cabbage, fresh to the firm from the University of Virginia, has just left a message asking a fellow named Skid Masterson what he knows about superconductivity. Why?*

*On the cover: Booz Allen data scientist Patrick, officer Xena*

He'd overheard somewhere that this Skid person was an expert. When Gary proudly reported his progress to his task leader, his boss responded with a look of horror.

Turns out Skid Masterson commanded Booz Allen Hamilton's entire defense portfolio, about two-thirds of the firm's business at that time. Imagining he'd committed a career-ending breach of protocol, Gary leaped for his phone to cancel the message. Before he could, it rang.

Skid was on the line. He brushed off Gary's apology and gave him a list of additional experts. He asked him about his interests, background, and aspirations. By conversation's end, Gary had made his first connection with Booz Allen's senior leadership.

"I vividly remember that first 12 months with the firm," he says. "It was daunting. It worked out for me, but more by serendipity than structure."

Now, 30 years later, Gary's a senior leader himself and he sees these secrets to his early success—that connectedness—given structure in a firm initiative called The Graduates Community.



The Graduates Community began in 2013 when Anastasiya Olds, then a consultant, took a critical look at the firm's existing approach to junior employee integration. It consisted of little more than a series of happy hours. Seeing white space, she mobilized her networks.

Anastasiya convinced colleagues and executives from all sectors of the firm to spend unpaid nights and weekends planning and hosting a series of development-focused events—think talks with capability leaders, volunteer opportunities with local not-for-profits, and workshops centered on core consulting skills. They would start with a September kick-off designed to draw in the year's college recruits and begin the process of cohort formation. A website with a calendar, online courses, and a social component tied it all together.

When Gary heard about the project, he was impressed not only by the initiative on display, but by the desire to illuminate a path to shared success. Anastasiya and her colleagues "wanted to make a difference," he says, "and not just for themselves, but for the broader community."

Before long, he signed on as The Graduates Community's sponsor.

To see the positive outcomes of The Graduates Community's approach, just attend one of its events, which offer junior employees the opportunity to get to know more than their own teams. They meet people from other offices, other projects, from all over the firm. "Access to people like themselves and to senior leaders who really care about them, that's the most valuable thing that The Graduates Community provides," says Gary.

That value is apparent in stories from people like Staff Technologist Jeff Young. During his entire first year, Jeff felt a bit isolated at his client site. On a tip from a Graduates Community email, he attended a hackathon at the firm's Innovation Center in DC. When he met Principal Steve Mills at the event, he asked him what skills he should develop to further his career. He pursued a cloud developer certification on Steve's advice, and since then Jeff's been able to compete for more advanced roles on a broader range of projects.

"The Graduates Community has been a crucial part of rounding out my experience," Jeff says.

Anastasiya began working on The Graduates Community during her very first year at the firm. It sprang from something simple: a desire to help her fellow junior employees succeed. By embracing her vision, Booz Allen is empowering a new generation to build a better world.

Gary, meanwhile, remembers what kept him on course. As one of five new hires on his team, he had a built-in cohort. He worked with a senior associate who deliberately made himself a resource. And, of course, there was that priceless guidance from Skid. Thanks to those circumstances—and a little luck—Gary was infused with his new employer's purpose-filled approach to client service and its people.

"People will stick around the company if they feel a connection," he says.



*Left: The Graduates Community team celebrates at the Booz Allen Excellence Awards.*

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**“My first assignment was for a study about the Department of Defense’s Strategic Defense Initiative or Star Wars program,” They were interested in superconductivity and I didn’t know jack about it.”**

—Gary Cubbage



## DATA IS THE NEW BLACK GOLD

IN THE MIDDLE EAST,  
ANALYTICS IS A VALUABLE  
COMMODITY

*The Middle East and North African regions have traditionally bet their economic fortunes on oil. But a new gusher of data offers opportunities for retailers in the region to drill down on customer spending habits and more, unearthing new opportunities for economic prosperity.*

Advances and investments in digital commerce—and ways to measure it—offer a boost to the MENA retail sector, which is forecast to grow 4.6 percent region-wide next year.

“These are huge advancements in the world of retail and that means a massive growth opportunity for regional retailers,” Booz Allen Hamilton Vice President Danny Karam. “However, this also intensifies the pressure on retailers to revisit the way they engage with customers and adapting their business models to changing preferences in the region.”

We’ve worked with MENA clients that serve millions of customers every day and contribute financial stability in a region that for too long relied on oil alone. Our clients need a deep understanding of their customers to serve them, but many haven’t yet started to track their customers’ spending habits. That means examining the massive amounts of data that so far have gone largely untapped.

“We’ve developed a ‘Customer Analytics Lifecycle’ that, as a critical first step, helps identify the customer decision data points that matter most to a retailer, as well as the areas where customer analytics can be most impactful,” says Jad Rahbani, a Booz Allen management and technology leader.

Then we identify the attributes that affect a customer decision and begin collecting data to create a customer analytics model. Then our data scientists—armed with the right customer research questions and insights—use machine learning, classification, graph theory, scoring, forecasting models, and other techniques to model and predict customer responses.

“We’re building an army of **data scientists** across our firm and the world. Some of our brightest are using **advanced machine learning algorithms** to identify unique customers,” Danny says.

None of this matters, however, if the model can’t impact a customer decision, so the model’s effectiveness and accuracy are continuously tweaked and improved.

The math reveals demographics and personal details of customers as well as purchasing behavior. And that data is used to craft real time, laser-focused, proactive customer campaigns.

The point is to look at the whole customer, then market directly to that person’s needs and preferences, instead of mass producing coupons, discounts and other offerings that reach everyone, but speak to no one.



We’re helping our clients morph into data-driven businesses and bringing the first of its kind thinking and leadership in the MENA region.

“It feels great to see how marketing directors have shifted their mindsets and started applying our techniques and leveraging our insights when reaching customers,” says Cyril Semaan, a Booz Allen analytics expert. “Or when a client’s IT team is wowed by next-gen Wi-Fi intelligence and analytics.”

“We’ve got the technology and data analytics expertise to drive growth and change,” Jad says. “We’re now working on helping our clients adopt a data-driven culture within their organization. It’s our model: to capitalize on the power of customer analytics, put innovation, analytics and customer-centricity at the core of the corporate culture.”

What does your data have to say? We’ve got data scientists all over the globe who can tell you.

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**“We’ve got the technology and data analytics expertise to drive growth and change. We’re now working on helping our clients adopt a data-driven culture within their organization. It’s our model: to capitalize on the power of customer analytics, put innovation, analytics and customer-centricity at the core of the corporate culture.”**

—Booz Allen management and technology leader Jad Rahbani



## A CLOUD SOLUTION FOR AMERICA'S OVERSEAS VOTERS

DIGITALLY DELIVERING BALLOTS  
TO AMERICANS STATIONED  
OUTSIDE THE U.S.

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*It was 6 weeks until Election Day 2016 and Booz Allen Hamilton's Mike O'Shea and his wife, Sandy, still needed to figure out how to cast their votes from Germany.*



It had been more than a month since Mike's work with Booz Allen's cyber capability had taken them to Darmstadt, but between marathon trips to IKEA and adjusting to life in a new country, there'd been no time to think about voting. It was important to both of them—"I haven't missed an election since bootcamp," Mike says—but now they worried it might be too late.

They considered trying to complete an absentee ballot at a nearby military base, but Mike recalled from his days in the Marine Corps that would involve long lines and inconvenient hours.

Seeking a better way, Sandy took to Google and discovered the Department of Defense's (DoD) Federal Voting Assistance Program (FVAP). Using FVAP.gov, she and Mike had their absentee ballots filled out and printed in less than an hour.

"It was straightforward and easy," Mike says. "We expected overseas voting to be a bigger hassle."

"Since 1986, it's been FVAP's mission to make sure Americans living abroad have everything they need to remotely exercise their voting rights. Prior to the 2016 election, the program's website was running on severely outdated technology. To make the rapid and radical improvements necessary to meet the demands the looming election would bring, FVAP turned to Booz Allen.

#### SCALING NEEDS INSPIRE A MOVE

When our team evaluated FVAP.gov, we found a site that offered mountains of information— absentee ballot laws, deadlines, and request forms for all 50 states—but little guidance on how to navigate it. Any revisions to this info, no matter how tiny, had to be coded in raw HTML and sent to the site's DoD-owned hosting facility for a review and posting process that often took weeks. Because this hosting facility could not adjust user capacity on demand, FVAP had to estimate peak traffic requirements and pay to accommodate them year-round. With an election season traffic surge looming, an estimate wouldn't cut it. To ensure that its site performed when users needed it most, FVAP needed the ability to instantly scale up capacity as conditions required. This couldn't

#### AGILITY IN THE CLOUD

The move to GovCloud also gave FVAP full front-to-back control over their site. With the previous host, "on average it would take several weeks to make any type of change," says Senior Lead Technologist Allison Martin, the project manager. "That made it difficult to rapidly respond to, for example, changes in state law that took place during the election cycle."



*Booz Allen cybersecurity specialist and software engineer Allison*

In the cloud, work could be completed far faster. A deployment cycle for a full site release that once took 40 days now took only 24 hours.

With this heightened agility, a number of new and necessary capabilities were added for back- and front-end users. They included a customized content management system with user-friendly features like a word processor-style text editor, as well as an automated online assistant resembling the wizards on popular tax-filing websites. Users got step-by-step guidance for acquiring, completing, and casting absentee ballots.

#### A MODEL FOR CLOUD MIGRATORS

The 2016 election provided an immediate test for FVAP.gov's new features and framework. The site served a record number of users without a single issue.

This is a special source of pride for Lead Engineer James Goodwin. His father served in the U.S. Air Force, which meant frequent moves for him and his family. Everywhere he went, from Nebraska to Belgium, the local military community made him feel welcome and supported.

"I've always been grateful for that hospitality," he says. "I loved having this opportunity to give back."

By helping FVAP become one of the first Defense Human Resource Activity components to successfully extricate itself from government servers, we've set an example that many will follow.

"FVAP is a model for agencies looking to move into the cloud," says Allison. "If FVAP can do it, so can they. And Booz Allen is ready to help."

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**"It was straightforward and easy. We expected overseas voting to be a bigger hassle."**

— Booz Allen cyber analyst  
Mike O'Shea

## SOLVING REAL-WORLD PROBLEMS IN THE SUMMER GAMES

FAST-GROWING INTERNSHIP PROGRAM UNEARTHES INGENUITY —AND FILLS THE TALENT PIPELINE

*Growing up, Roshan Daniel was obsessed with building. Legos were his tools of his choice, only he never followed the directions to create the model. He preferred to mix and match pieces, conjuring something entirely new from his imagination.*





*Booz Allen Summer Games interns*

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**“Booz Allen’s Summer Games is not your typical internship. And word is out. This year we had more than 7,000 applicants for 450 internships.”**

—Executive Vice President and Chief Personnel Officer  
Betty Thompson

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Roshan, a West Virginia University student, took advantage of his building skills as a Booz Allen Hamilton Summer Games intern and tackled issues around navigation for the blind. Over the 10-week project, his team used 3-D imaging, advancements in computer vision, and machine learning to help blind people navigate dynamic environments.

It’s what makes our internship program different. Students have the freedom to capitalize on their imagination, to grow, run with ideas, and learn the process of building something new in an unobstructed environment.



**Summer Games Internship Program**

#### **FROM IDEA TO REALITY (AND POSSIBLY FUNDING)**

The Summer Games is turning the traditional internship experience on its head. Participating interns are encouraged to collaborate, and given intellectual freedom to develop and prototype ideas aimed at solving major world problems. Think large-scale issues including human trafficking and disease detection, to more granular challenges like infrastructure repair and military fleet management.

Since launching in 2014 with a small batch of 60 interns, the program has grown threefold and a little more than 80 percent of offer eligible interns end up joining Booz Allen full-time. For the 2017 class, several thousand applications were received for 450 available slots.

Interns are grouped into teams, each led by a Booz Allen senior leader. Teams are assigned a major world problem to solve, based off a curated list of crowdsourced issues submitted by our employees. In the span of 10 weeks the teams meet, collaborate, and iterate solutions to their respective issues.

That work culminates in three “Shark Tank”-inspired pitch sessions in front of a panel of Booz Allen vice presidents, where teams compete to win funding and mentoring to grow their idea.

Research shows that students today want internships that allow them to contribute real ideas, grow, and learn from each other. And our client teams are in search of new ideas to solve existing, persistent problems. It’s a win-win, and enables interns to learn firsthand how the firm values people with a champion’s heart who bring joy in the pursuit—win or lose.

Take it from Roshan.

“We didn’t end up winning the Summer Games competition but, at the end of the day, that didn’t matter,” he says. “I got the opportunity to mix and match bits and pieces of a problem to build a solution that could help real people. And connect with a group of problem-solvers.”

## **THE INTERNS OWN IT**

Of course, there’s the added bonus of potential employment.

Last summer, six interns, students from the University of Hawaii, had the unique opportunity of using virtual reality (VR) to recreate the opening minutes of the attack on Pearl Harbor for a local not-for-profit, the Pacific Aviation Museum, located on Ford Island in buildings that still bear the scars from that day.

Booz Allen suggested the VR project to the museum; several of our employees serve on the board of directors and the project was a great way to extend the firm’s commitment to its mission, while also showcasing our virtual and augmented reality capabilities.

Interns were exposed to and learned many new skills, from VR-specific techniques using the modeling tool Maya to programming in Unity, an industry-leading VR/AR (augmented reality) engine.

The interns ramped up fast.





Booz Allen lead engineer Jolene

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**“As with any project, there were a lot of hurdles, but we really let the interns own this project. They were passionate about it and it showed—they engaged the client early and often and delivered the product the client wanted.”**

—Staff Technologist  
Peter Justeson

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“As with any project, there were a lot of hurdles, but we really let the interns own this project. They were passionate about it and it showed—they engaged the client early and often and delivered the product the client wanted,” says Staff Technologist Peter Justeson, one of the Honolulu experts who spent hours coaching and supporting the interns through their programming learning curve.

One intern is already a Booz Allen employee and four others were extended offers.

“The Summer Games experience gave me a taste of Booz Allen’s culture. Everyone took time to answer our questions—to share their expertise to help us learn,” says intern-turned-employee John Paul “JP” McManus, a consultant. “I enjoyed the give and take with the client, the need to meet the client’s expectations, while also understanding, from an operational perspective, what’s feasible from our end.”

And Michael Jacob, a recent graduate of James Madison University, also made the intern-to-full-time jump after his Summer Games experience.

Michael is one of the founders of BeatAwake, a tool that analyzes biometric data to help prevent life threatening situations. It’s an idea he came up with during the Summer Games. He worked with André Nguyen, now a technologist, to create technology that pairs up to wearable device and leverages biometric data to determine anomalies in heartrate, and alerts the wearer when one occurs.

Michael and Andre both presented a prototype of the technology at the 2016 Amazon Web Services’ re:Invent conference.

“I was able to take an idea, find someone who believed in it too, and see the technology come alive. That’s what so cool about Booz Allen, and this idea that was born out of the Summer Games. We’re not just sitting around thinking out loud, we’re making our ideas happen.”

## A HOME FOR ENTREPRENEURIAL TECH TALENT

MEET SOME TECHIES WHO  
CHOSE TO HELP  
GOVERNMENT INSTEAD OF  
MOVING TO SILICON VALLEY

*Booz Allen data  
scientist Albert*



# TECH TALENT

Silicon Valley holds the justifiable allure of all things digital, but there's one thing missing: the opportunity to improve the way government works through innovative, mission-focused solutions. Startups in the West may have once been the only option for forward-thinking tech talent, but not anymore.

At Booz Allen Hamilton, computer scientists, engineers, and other digital professionals have found a home. They've chosen to work here because they want to make a difference.

Our people are passionate about solving complex client problems across the firm's government work. In integrated and collaborative teams, they're delivering solutions that have a direct impact on our nation's security, intelligence, and civil missions. Meet three people who chose to put their talent to work in service to their government, over Silicon Valley.



## THE GAMER

Aileen Zhou

Aileen designs and develops standalone, Web-based software for computer-based training applications. In other words, she's a video game developer, working to use gaming functionalities for a variety of government agencies. She does this work from our office in Red Bank, New Jersey, a small beach town with cobblestone streets, Victorian street lamps, and roots dating to the 1600s. Today, our Red Bank location hosts teams doing high-tech government work in areas such as cyber, instructional development, and immersive learning teams.

*One of the main reasons I prefer working at Booz Allen is that my developing skills have purpose. The projects I've worked on can be best described as "meaningful gaming." My team uses gamification to create engaging e-learning software to replace monotonous trainings that are usually just ignored. I've made games for clients like the Department of Energy, the military, the Department of Veterans Affairs, and others. The agencies I've worked with run the gamut from tech savvy to the tech illiterate, which has been a unique experience in terms of realizing how technology can best serve diverse audiences. Some of my projects can be as simple as a drag-and-drop game to something as complicated as creating a satellite equipment simulator. It's all different, but ultimately the end goal is to bring better solutions to the government.*

**"The projects I've worked on can be best described as 'meaningful gaming.' My team uses gamification to create engaging e-learning software to replace monotonous trainings that are usually just ignored."**

# THE CONSULTANT


## Graham Gilmer

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Graham leads Booz Allen's investments in data science and machine intelligence, charting the firm's approach to advanced analytics and accelerating the adoption of machine learning technologies across the Federal Government.

Graham personifies the way our consulting heritage infuses our cutting-edge tech work, a big differentiator for the firm. And he does it in DC, well established as the hub of American politics. The nation's capital is also becoming increasingly notable for something else: an accessible tech community.

*I started my career on the West Coast out of Stanford, but was quickly drawn to Booz Allen because of the scale and complexity of problems facing government. As consultants, we have the opportunity to rotate across projects and contribute to some of the most important challenges in the federal space, and help agencies connect dots. It's especially thrilling given we're on the precipice of a new age of computing, driven by ubiquitous machine learning that will have dramatic effects across society. And the government will play an important role as that evolves. How we adopt new tech and adapt to change will all depend on government resilience, and I think Booz Allen is well positioned to support that given the people who work here aren't just smart, but truly passionate about public service. It's one thing to build cool tech and hope people use it. It's a whole other thing to have the infrastructure and network to inspire adoption of change. The technologists that make up Booz Allen get that. They're not just here to say they did something cool. They're here to change the world for the better.*



**"We're on the precipice of a new age of computing, driven by ubiquitous machine learning that will have dramatic effects across society. And the government will play an important role as that evolves."**


# THE DESIGNER

## Adam Hays

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Adam leads the development of highly complex, award-winning, interactive applications for desktop, web, and mobile platforms, also from our Red Bank, New Jersey, location.

*Honestly, I was surprised by how much creative work there was to do in the government space, from serious games, immersive learning, modeling and simulations, to augmented and virtual reality, mobile apps, and communications. There's a whole host of problems that need creative ideas and ingenuity. I love getting to bring my design skills to the table and inject my own creativity into my work for government and the military, but knowing that my contributions are actually making agencies operate more efficiently is what I'm passionate about. I've worked on projects that help keep real on-the-ground soldiers safe, I've assisted veterans so they get better care, and I've updated how organizations operate in digital spaces. Those are all opportunities I feel really fortunate to have had. At some tech companies, you have a specific role where you do one thing well and there's very little room to grow or affect real change in the world. You may do your job for a few years before moving on to the next gig, or you may feel like you've gone as far as you can and simply settle. That's never been my experience at Booz Allen—there's always something around the corner.*



**"I love getting to bring my design skills to the table and inject my own creativity into my work for government and the military, but knowing that my contributions are actually making agencies operate more efficiently is what I'm passionate about."**

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At Booz Allen, we believe that the best ideas—and the greatest mission impact—come from diverse minds working together.

Our collective ingenuity shines through when people like Aileen, Graham, and Adam are free to think creatively, innovate, and implement powerful solutions for our clients' toughest challenges.

# APPENDIX

## NON-GAAP MEASURES

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We publicly disclose certain non-GAAP financial measurements in this report, including Revenue, Excluding Billable Expenses, Adjusted EBITDA, Adjusted EBITDA Margin, Adjusted Net Income, and Adjusted Diluted Earnings Per Share, or Adjusted Diluted EPS, because management uses these measures for business planning purposes, including to manage our business against internal projected results of operations and measure our performance. We view Adjusted EBITDA, Adjusted EBITDA Margin, Adjusted Net Income, and Adjusted Diluted EPS as measures of our core operating business, which exclude the impact of the items detailed below, as these items are generally not operational in nature. These non-GAAP measures also provide another basis for comparing period to period results by excluding potential differences caused by non-operational and unusual or non-recurring items. In addition, we use Revenue, Excluding Billable Expenses because it provides management useful information about the Company's operating performance by excluding the impact of costs that are not indicative of the level of productivity of our consulting staff headcount and our overall direct labor, which management believes provides useful information to our investors about our core operations. We present these supplemental measures because we believe that these measures provide investors and securities analysts with important supplemental information with which to evaluate our performance, long term earnings potential, or liquidity, as applicable, and to enable them to assess our performance on the same basis as management. These supplemental performance measurements may vary from and may not be comparable to similarly titled measures by other companies in our industry. Revenue, Excluding Billable Expenses, Adjusted EBITDA, Adjusted EBITDA Margin, Adjusted Net Income and Adjusted Diluted EPS are not recognized measurements under accounting principles generally accepted in the United States, or GAAP, and when analyzing our performance or liquidity, as applicable, investors should (i) evaluate each adjustment in our reconciliation of revenue to Revenue Excluding Billable Expenses, net income to Adjusted EBITDA, Adjusted EBITDA Margin, Adjusted Net Income and Adjusted Diluted Earnings Per Share, (ii) use Revenue, Excluding Billable Expenses, Adjusted EBITDA, and Adjusted EBITDA Margin, Adjusted Net Income, and Adjusted Diluted EPS in addition to, and not as an alternative to, revenue, net income or diluted EPS, as measures of operating results, each as defined under GAAP. We have defined the aforementioned non-GAAP measures as follows:

- "Revenue, Excluding Billable Expenses" represents revenue less billable expenses. We use Revenue, Excluding Billable Expenses because it provides management useful information about the Company's operating performance by excluding the impact of costs that are not indicative of the level of productivity of our consulting staff headcount and our overall direct labor, which management believes provides useful information to our investors about our core operations.
- "Adjusted EBITDA" represents net income before income taxes, net interest and other expense, and depreciation and amortization and before certain other items, including transaction costs, fees, losses, and expenses, including fees associated with debt prepayments. We prepare Adjusted EBITDA and Adjusted EBITDA Margin to eliminate the impact of items we do not consider indicative of ongoing operating performance due to their inherent unusual, extraordinary, or non-recurring nature or because they result from an event of a similar nature.
- "Adjusted Net Income" represents net income before: (i) adjustments related to the amortization of intangible assets resulting from the acquisition of our Company by The Carlyle Group, (ii) transaction costs, fees, losses, and expenses, including fees associated with debt prepayments, (iii) amortization or write-off of debt issuance costs and write-off of original issue discount, and (iv) release of income tax reserves, in each case net of the tax effect where appropriate calculated using an assumed effective tax rate. We prepare Adjusted Net Income to eliminate the impact of items, net of tax, we do not consider indicative of ongoing operating performance due to their inherent unusual, extraordinary, or non-recurring nature or because they result from an event of a similar nature.
- "Adjusted Diluted EPS" represents diluted EPS calculated using Adjusted Net Income as opposed to net income. Additionally, Adjusted Diluted EPS does not contemplate any adjustments to net income as required under the two-class method as disclosed in the footnotes to the financial statements.

Below is a reconciliation of Revenue, Excluding Billable Expenses, Adjusted EBITDA, Adjusted EBITDA Margin, Adjusted Net Income, and Adjusted Diluted EPS to the most directly comparable financial measure calculated and presented in accordance with GAAP.

## BOOZ ALLEN HAMILTON HOLDING CORPORATION

### NON-GAAP FINANCIAL INFORMATION

(AMOUNTS IN THOUSANDS, EXCEPT  
SHARE AND PER SHARE DATA)

FISCAL YEAR ENDED  
MARCH 31,

REVENUE, EXCLUDING BILLABLE EXPENSES	2017 (UNAUDITED)	2016 (UNAUDITED)
Revenue	\$5,804,284	\$5,405,738
Billable Expenses	1,751,077	1,513,083
Revenue, Excluding Billable Expenses	<b>\$4,053,207</b>	<b>\$3,892,655</b>
<b>EBITDA, ADJUSTED EBITDA &amp; ADJUSTED EBITDA MARGIN</b>		
Net income	\$252,490	\$294,094
Income tax expense	159,410	85,368
Interest and other, net (c)	72,347	65,122
Depreciation and amortization	59,544	61,536
EBITDA	543,791	506,120
Transaction expenses (b)	3,354	-
Adjusted EBITDA	<b>\$547,145</b>	<b>\$506,120</b>
Revenue	5,804,284	5,405,738
Adjusted EBITDA Margin	9.4%	9.4%
<b>ADJUSTED NET INCOME</b>		
Net income	\$252,490	\$294,094
Amortization of intangible assets (a)	4,225	4,225
Transaction expenses (b)	3,354	-
Release of income tax reserves (d)	-	(53,301)
Amortization or write-off of debt issuance costs and write-off of original issue discount	8,866	5,201
Adjustments for tax effect (e)	(6,578)	(3,770)
Adjusted Net Income	<b>\$262,357</b>	<b>\$246,449</b>
<b>ADJUSTED DILUTED EARNINGS PER SHARE</b>		
Weighted-average number of diluted shares outstanding	150,274,640	149,719,137
Adjusted Net Income Per Diluted Share (f)	<b>\$1.75</b>	<b>\$1.65</b>

- a.) Reflects amortization of intangible assets resulting from the acquisition of our Company by The Carlyle Group.
- b.) Fiscal 2017 reflects debt refinancing costs incurred in connection with the refinancing transaction consummated on July 13, 2016.
- c.) Reflects the combination of Interest expense and Other income (expense), net from the consolidated income statement.
- d.) Release of pre-acquisition income tax reserves assumed by the Company in connection with the acquisition of our Company by The Carlyle Group.
- e.) Reflects tax effect of adjustments at an assumed marginal tax rate of 40%.
- f.) Excludes an adjustment of approximately \$2.3 million and \$3.5 million of net earnings for fiscal 2017 and 2016 respectively, associated with the application of the two-class method for computing diluted earnings per share.

