

## DEFENSE INNOVATION BOARD

Open Meeting Minutes

April 4, 2017

9:00 AM to 11:00 AM

The Pentagon, Washington, D.C.

The Defense Innovation Board (DIB) is a federal advisory committee within the Department of Defense (DoD) operating pursuant to the Federal Advisory Committee Act of 1972, the Government in Sunshine Act of 1976, and other appropriate federal regulations. The DIB meets quarterly and held its third public session on April 4, 2017 from 9:00 AM to 11:00 AM in room B6 of the Pentagon Conference Center, The Pentagon, Washington, D.C.

### DIB Members (voting)(10)

Dr. Eric Schmidt (Chair)  
Dr. Richard Murray  
Mr. Walter Isaacson  
Dr. Eric Lander  
Ms. Marne Levine  
Dr. J. Michael McQuade  
ADM (ret) William McRaven,  
USN  
Mr. Milo Medin  
Ms. Jennifer Pahlka  
Dr. Neil deGrasse Tyson

### Guest Speakers (7)

Lt Gen Jack Shanahan, USAF,  
Office of the Undersecretary  
of Defense for Intelligence  
LTG Ed Cardon, USA, Office  
of the Secretary of the Army,  
Office of Business  
Transformation  
Mr. Chris Lynch, Defense  
Digital Service  
Ms. Sharon Woods, Defense  
Digital Service  
VADM William Brown, USN,  
Joint Staff/J4, Director of  
Logistics  
Mr. Bess Dopkeen, Cost  
Assessment and Program  
Evaluation  
Brig Gen B. Chance Saltzman,  
USAF, USAF/A3, Director of  
Current Operations

### DIB Ex-Officios (non-voting)(0)

None

### DIB Staff Support (non-voting)(8)

Mr. Joshua Marcuse, Executive Director  
Ms. Roma Laster, Designated Federal Officer  
Mr. Michael Gable, Alternate Designated  
Federal Officer  
Maj Kaly McKenna, USAF  
Ms. Francine Anderson  
Mr. Nicolas Lopez  
Mr. Aaron Schumacher  
Mr. Alexander Kravets

### Public Session Attendees (89)

### Public Commenters (9)

Ms. Erin Simpson  
LTC Ben Taylor, USA  
Mr. Joseph Schuman  
Mr. Jesse Allman  
Mr. Christopher Thomas  
Ms. Sarah Soliman  
Maj Steven "Rhino" Mwesigwa, USAF  
Col Braxton Rehm, USAF  
CPT Jim Perkins, USA

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### PUBLIC MEETING SESSION

At 9:06 AM, Mr. Michael Gable, Alternate Designated Federal Officer, opened the public session and welcomed the members of the public. Mr. Joshua Marcuse introduced the Defense Innovation Board members and explained the agenda for the meeting. He then introduced the Chair.

Dr. Eric Schmidt, DIB Chairman, thanked everyone for attending. He started the meeting by asking Dr. Richard Murray to give an overview of the proposed Recommendation 12 based on the Board's findings.

Dr. Murray began by stating that the Board had the opportunity to visit many parts of DoD that are highly active in using software and data, which demonstrated a heightened need for a more software-centric approach. He stated that the Board saw one of DoD's key roles as an integrator of a huge number of systems coming from the Services along with Services coming from coalition partners, which brings with it its own unique challenges and need for rapid innovation. The connection between all these systems is the software. Therefore, he added that the Department must find ways to move from a hardware-centric mindset to a software-centric mindset at a global level and remarked how all-previous recommendations are interrelated, including making computer science a core competency, moving towards a rapid and iterative software development process, having access to source code, and providing a local software engineering capability to commanders.

Dr. Murray referenced an example the Board saw at a Combined Air Operations Center (CAOC) in Qatar that described a piece of software that had gone through the acquisition process yet did not accomplish the job that needed to be done. A small group of programmers, he noted, would have been able to fix and enhance the tool in a matter of days but since there were no available resources, they reverted to using a whiteboard instead of the software system. He then reviewed the rapid advances in artificial intelligence and machine learning which require vast amounts of data and said there is likely a role for data that DoD has not yet realized. Therefore, he said it is important that we make better use of data, specifically that the Department needs to collect more data, secure that data, and feed that data into algorithms so that we uncover key insights and create technical capability that combined, will lead to strategic advantage. Dr. Murray concluded his introductory remarks by reemphasizing that the way software needs to be procured and developed is fundamentally different than the way hardware is procured. He stated that it shouldn't follow the standard requirements process, but the agile nature of continuous development, integration, and testing.

Dr. J. Michael McQuade thanked the Board and the audience for attending and joining in a really important conversation around data and data repositories. He then outlined two important paradigms; the first, a world in which computation, bandwidth, and storage are abundant resources, and the second, a world in which data has become, in some ways, the most valuable strategic asset of the 21<sup>st</sup> century. Dr. McQuade highlighted that the value of data can change over time, both positively and negatively, and it is unknown in the moment when making a decision regarding collecting and storing data. If the Department passes on collecting data, it completely loses the ability to use it in the future when it may be found to have value. He

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acknowledged there are concerns around privacy, security, and intellectual property, which he said would be addressed later in the session. He then mentioned that Recommendation 5, Catalyze Innovations in Artificial Intelligence and Machine Learning, is only effective if the technologies have data on which to find patterns and analytical information can be extracted. Without data, the ability to have Machine Learning systems that add value to the warfighter, optimize the efficiency of systems, and ensure the Department stays ahead of adversaries becomes an exercise in futility. He concluded by saying that the Department's starting assumption should be that all military data should be collected, stored, and made available for future use.

Mr. Marcuse transitioned to introduce the six guest speakers who would address the Board and the audience. They included: Lieutenant General Jack Shanahan, Lieutenant General Ed Cardon, Chris Lynch (Defense Digital Service), Vice Admiral William Brown, Bess Dopkeen, and Brigadier General B. Chance Saltzman.

Lt Gen Jack Shanahan began by applauding the rapid and sustained growth in the number intelligence, surveillance, reconnaissance (ISR) capabilities, mainly unmanned aerial vehicles that had been fielded over the past 15 years. The amount of sensors deployed grew by 600%. He noted that it took 13 years to amass 1 million flight hours and only a further two and a half years to double to 2 million. Further, he noted that in the Air Force, there was a 1,500% increase in ISR capabilities since 2001. In any given day, the Air Force ISR enterprise collects 22 terabytes of data. That amount is roughly twice the holdings of the printed version of the Library of Congress. Lt Gen Shanahan proceeded to explain that this 'tsunami' of data is overwhelming analysts who have to exploit, analyze, and disseminate it. Additionally, he added, analysts need the ability to combine the ISR data with data from other intelligent sensors to get the full value out of exploiting the data. He acknowledged that private industry is ahead of the Department in the areas of data fusion and analytics, data science, structured observation management, artificial intelligence, neural heads, deep learning, and computer vision. He noted that there are discrete projects within DoD attacking bits and pieces but all lack the coherency that is required to help the warfighter at the tactical edge and have timelines from two to five years. Lt Gen Shanahan mentioned a proposal to aid the DoD's efforts that involves biting off a manageable chunk with the goal of delivering functionality within a year. The manageable chunk, he stated, would involve full-motion video of tactical unmanned aerial systems being used for counterterrorism and counterinsurgency. He stressed the boldness of the plan will be to deliver capability within six months to a year. For the first time in his 34-year career, he said the limitation is not the number of platforms and sensors, but the ability to exploit the data. He concluded his remarks mentioning that he would dive deeper into his proposal in the classified briefing later in the day.

LTG Ed Cardon began his remarks by contrasting the intel community's use of data with that of the Department, whom, he said, does not use data as a core mission set in everything they do. He continued to explain that the intel community relies on data for actionable intelligence to aid decision making, in essence, using data to uncover the unknowns. This is a very different use of data than understanding how many tanks are owned by the U.S. Army or what the biggest cost drivers are for Apache helicopters. LTG Cardon also posited a second issue involving the use of PowerPoint and how it impacts data. He said that often the visualizations and context coming from the data systems are lost when the data is translated into other systems. Therefore, there is

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no real sense for what the validity of the data was or if someone's opinion impacted the data being presented. He stressed that collecting data must answer a question to help operational commanders in the field and become better engrained into operational, targeting, and logistics processes. He said lacking data as part of the defined processes leads to things like finding out that a three year old problem with an Army platform is actually because of a \$100 part.

LTG Cardon proceeded to discuss computer science as it relates specifically to talent within the Department and that there is still not a career field within OPM for data scientists. He stressed that to match our adversaries and make use of all the Department's data, we will need to harness and develop a strong computer science competency within the Department. If the Department doesn't, he warned, it will continue to struggle and experience more problems with data. He concluded by saying agility will be hindered by rules and regulations and that the majority of legislation is built off of 19<sup>th</sup> and 20<sup>th</sup> century laws that are being applied to a 21<sup>st</sup> century context.

Mr. Chris Lynch, head of the Defense Digital Service (DDS), began by mentioning a few projects DDS is working on. The first, Data.mil, is an open data site that combined various DoD datasets and shows unique and interesting ways it could be presented to the public. He explained that DDS had partnered with LifeStories and Data.World, two private sector organizations, and allowed them to explore and present data from WW1 to the Vietnam War. Mr. Lynch mentioned that DDS had run around 20 projects throughout the Department and uncovered a few recurring themes stifling the use of data. First, he said, engineers and people who understand, and can make use of, data have left the building. Second, the Department must have an attitude friendly to using private industry and open source technologies and move away from the attitude that if the Department doesn't build or control it, it can't use it. Primarily, he said, because the Department can't hire all of the greatest computer and data scientists in the world, leveraging open source libraries will help accelerate and better execute our programs and missions. Third, the Department must have available resources to fix small problems and he mentioned that one DDS developer fixed a problem in Qatar in three days that a team had spent four months trying to solve. He also said that a lot of what DDS does is try to come up with rational and reasonable ways that they can apply their skillsets to a mission that traditionally does not recognize the value of strong engineering talent. Mr. Lynch transitioned to a second project, code.mil, and introduced Sharon Woods.

Ms. Sharon Woods, General Counsel for Defense Digital Service and project lead for code.mil, began by explaining how code.mil is an experiment in open source. She acknowledged that there are many barriers within DoD, both real and imagined, that stifle working in the open source community. The goal of code.mil, she said, is to form a cross functional team of lawyers and developers that explore different pathways to meaningfully participate in open source technology. Ms. Woods mentioned that most of the open source initiatives are policy driven, and have not involved developers so they are inconsistent with the practices in the open source community. She concluded by expressing her hope that code.mil will be a catalyst to connect the DoD community with external developers and hobbyist community.

VADM William Brown, Director of Logistics for the Joint Staff, began by saying that he had been in the business of logistics for 37 years and the logistics community has been using

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computers for a long time. He stated that logisticians do not want to run out of options because that would then limit commanders. He mentioned that every Service has their own enterprise resource planning (ERP) system to manage parts and commodities with multiple systems at the strategic and operational levels. He questioned how the Services can tie these systems together to exploit opportunities and options. He proceeded to discuss how efficient logistics are the backbone of the US's deterrent capability because, if the force cannot be sustained, deterrence is not credible. He concluded by mentioning that the greatest opportunities that have saved money in his career had been when he had access to data and that going forward data would only get more important.

Ms. Bess Dopkeen began by stating that there is an assumption that the Department has a ton of data and it just needs software and people to analyze it. She continued to say that she can only speak for acquisition, and not for the intel, testing, or logistics communities, but the assumption is false. She outlined that leadership relies on experience and trusted advisors because timely, authoritative data is not available for real analysis. There is no amazing amount of data because it was never strategically collected. In fact, she stated, everyone fights the collection and sharing of data at every juncture. Organizations compete for authority, leadership's trust, and resources. Data owners are incentivized to limit access and share only when directed. She added that the only way to collect and access data is through personal relationships. She also mentioned that there is a perception that collecting and exposing data is costly and invites oversight questions, exposing issues to others, or inviting others to encroach on a mission. Thus, she concluded, fear is what stifles the collection and sharing of data. Therefore, she said, leadership makes decisions on the basis of judgement and experience, not holistic analysis. Culture, she said, must change and embrace the collection and use of data to inform decision making. To aid this effort, Ms. Dopkeen explained her effort at CADE, the Cost Assessment Data Enterprise, which is an initiative to collect and organize data across the cost community and make it available broadly. The effort is closing major data gaps through improved policies and data collection mechanisms and by teaming with industry. Furthering her discussion on fear, she mentioned that the Department heavily penalizes problems and has no tolerance for failure. This perpetuates a cycle of slow progress and zero risk taking. She concluded that change will come from leadership who will have to change the culture and environment.

Brig Gen B. Chance Saltzman, the Air Force's Director of Future Operations, began by saying he would offer a few thoughts in terms of operations. He explained how he was asked by General Goldfein to organize the Air Force's thoughts for command and control systems for the 2030 timeframe. He disagreed with Ms. Dopkeen's statement that data is not available, he said it is available, the Department just does not pull it together in a way that builds situational awareness and intelligence in an operationally relevant timeline. The real problem, he continued, becomes evolving our current command and control structures into the command and control structures of the future. Structures that connects the right capabilities with the right data, at the right time. To that end, he questioned how the Department can detangle data, mission applications, and infrastructure. Since all three pieces get wrapped up into a command and control system, it becomes difficult to upgrade each individual component in an operationally relevant timeline. He added that there are a lot of organizations that claim to own data including the government, industry, and the intelligence community. This convoluted environment creates silos and hurdles to accessing data. It must be put in one place and backed with policy that allows access to data

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universally. He concluded by reaffirming his two most important areas of effort are operational concepts and the technologies the Department needs to invest in to utilize data and evolve command and control structures.

Dr. Schmidt began the Board deliberation by outlining three different categories of data. The first are tools, and he used the example of ISR imaging analysis and said that in the private sector, 22 terabytes of data is not overwhelming with modern computing. The second category he outlined was data copying – where a large number of men and women are copying and pasting data from one document or system to another versus adding real value. The real problem with this is that there needs to be a system that scales very rapidly in times of conflict. The third category he mentioned was what he labeled Bureaucratic Data. This is data that is locked in place by culture – sharing restrictions, legitimate and illegitimate security concerns, information hiding, etc. The third point, Dr. Schmidt said, can be addressed by management and culture changes.

Dr. Eric Lander posed a question that if the Department can solve the ‘data problem’ and gain strategic insights, how can the Department ensure that security is fully under control so an adversary does not have access to a one-stop shop to the Department’s key insights?

Dr. Neil deGrasse Tyson agreed with the question and furthered the thought by likening the problem to the Library of Alexandria that burned down, destroying irreplaceable manuscripts. So, he asked, is there the possibility of loss of data if it is all in one place and what occurs if an enemy gains access to all the data at once? Dr. Tyson continued by drawing from his experience in astrophysics saying that querying the data – asking the right questions – was the most important aspect of gaining value from data. To that end, he said the Department must ensure that it puts effort into not only collecting the data and making it available for analysis, but also having a strategy for how it will utilize and query the data.

Mr. Milo Medin began to address Dr. Tyson’s statement by correcting the misconception that data is more vulnerable when compiled into a repository than it is in disparate places. He said, with the ability to consolidate storage in a coherent way, one gets access control and logging that in itself becomes data that can be used as monitoring tools. He also said cryptography has become the security mechanism, and combined with sharding of data in multiple locations is a pretty effective way of preventing data from being removed. He continued to describe that the Department seemingly focuses on communication security versus information security. For instance, protecting data in transit, not at rest, which gives a false sense of security. Mr. Medin said that this model of thinking about how cryptography can be used to segment data and create intentional access control is going to be incredibly important for the Department moving forward. Finally, he concluded, that the Department should set annual reduction targets for compute, bandwidth, and storage, similar to what the private sector does, to improve unit costs and continually enable increases in capability without increases of cost.

Mr. Walter Isaacson agreed with Mr. Medin’s first point about the vulnerability of data being higher when disparate and safer when centrally managed. Dr. Lander also agreed and expanded upon an example from healthcare, where most individual academic laboratories and medical centers have very limited security when compared with cloud-infrastructure security. Mr. Isaacson continued to specify that just putting data in the cloud does not inherently mean it will

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be safer. Precautions like logging and access control are crucial to protect and monitor that data.

Dr. Schmidt outlined that the Department has thousands of datacenters and the proposal to consolidate data does not mean to create one, massive data repository. Instead, he continued, it means turning thousands into hundreds with proper security, logging, and redundancies to ensure data cannot be lost.

Ms. Jennifer Pahlka refocused the conversation on the underlying problem of manual data collection and legacy systems and infrastructure not built to output data in real-time. She mentioned that, though she is pro-cloud, the Department needs to first fix the collection and entry of data. She also said that once this shift to real-time data dashboards occurs, data acts like a compass to allow for real-time course correction. To this end, Ms. Pahlka said that the requirements culture needs to shift to include planning for dashboards and metrics from the start of a program and not just be an afterthought.

Ms. Marne Levine added that at Instagram and Facebook, the collection, analysis, and storage of data is not just fundamental to her business, but is in fact the entire business. She continued to say that data is the fuel behind revenue streams and providing useful and interesting content to users, just as much as it allows them to internally operate smarter, better, and faster. The culture of collecting, analyzing, and storing data, she added, is emphasized from the CEO downward. Ms. Levine concluded by saying that normalizing data at the start is a best practice to get into, otherwise, it is a time consuming process when that data needs to be used, which can act as a barrier itself.

Dr. McQuade asked ADM Bill McRaven if he were in charge, knowing how the system actually works, how he would implement a big data strategy.

ADM McRaven began by saying first, culturally, people will have to believe big data will be of value to the warfighter. As an example, he mentioned predictive analytics deployed in Iraq and Afghanistan that claimed to show where the next Improvised Explosive Device attack would be never worked. Instead, what worked was talking to village elders and getting accurate and timely information that translated into saving lives. ADM McRaven continued to stress that once it is proven that big data can aid warfighters in a tactical sense, then the culture will begin to shift.

Dr. McQuade posed a hypothetical to ADM McRaven and asked what his view would be if big data had no direct impact to warfighters but generated 10-15% efficiencies in the 'back office' of the Department for costs and logistics.

ADM McRaven agreed that it would still be very beneficial and would resonate strongly with a certain population within the Department. He alluded to the North Korean threat saying that logistics is truly the only way to stop the North Koreans from advancing south.

Dr. McQuade concluded that perhaps the recommendation could be stronger if it included focusing on an area of big data that could provide the greatest amount of initial value. His recommendation was ISR considering recent advances in computer vision and removing some of

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the burden from analysts.

Dr. Tyson added that it is important to not confuse access to big data with big data itself. He said that big data may have the solution to a question yet to be asked by someone on the ground. Therefore, the ultimate value only is seen when the proper threaded inquiry provides a very local answer.

Mr. Isaacson brought up that the recommendation mentions that vast amounts of data would need to be centralized and a large emphasis would have to be put on improving encryption and security. He said that notion is very defensive and that to Mr. Medin's and Dr. Schmidt's points earlier, the recommendation should highlight instead how the centralization and standardization of big data would actually enhance security.

Dr. Murray began to wrap up the Board's discussion by summarizing the main points, beginning with the notion that data in a centralized location might actually be more secure. Secondly, he noted the Department should embrace a more data-driven mindset and create an agile culture of collection analysis, storage, and access. Part of this, he continued, is allowing machines to handle more responsibility, allowing people to spend their time evaluating data and making decisions rather than low-level data mining and processing. The other part, is continually ensuring the tactical value for the warfighter is proven.

Mr. Marcuse transitioned the meeting to a presentation the staff of the Defense Innovation Board created that showcased initiatives around the Department related to the Board's recommendations. He began by reminding the audience that the previous Secretary of Defense accepted three of the eleven original recommendations. The first was to create a DoD Chief Innovation Officer. The second was that he announced a new cyber-recruiting initiative and other key initiatives to make computer science a core competency within the Department. The third was that DoD would create a center for Artificial Intelligence and Machine Learning. The new Secretary, he said, was evaluating all of the recommendations to determine how he would like to move forward.

Mr. Marcuse continued by outlining that the first recommendation, appointing a Chief Innovation Officer, will be impacted by the new legislation reorganizing the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD(AT&L)) but in the meantime, various activities the Board wanted the Chief Innovation Officer to undertake are actually being done in a variety of places. He highlighted that the Chief Information Officer has partnered with an incubator and global technology accelerator, 1776, and received access to their organization which provides better access to over 500 startups that may be relevant and foster closer connections with the type of innovative and agile culture discussed earlier. Second, MD5, an organization out of the National Defense University, runs hack-a-thons around the country and other programs that are directly related to building capacity for innovation in the workforce, culture change, and connecting innovators throughout the Department's ecosystem.

With respect to Recommendation 2, Mr. Marcuse continued, the Navy has done remarkable things embedding warfighters with software engineers in a program called Hack the Sky. He also mentioned that the Army was building on some of the Force of the Future initiatives to bring



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in more civilian experts using direct commission and lateral commission, similar to what had been done for doctors and lawyers.

With respect to Recommendation 6, Mr. Marcuse pointed to the Defense Innovation Unit Experimental (DIUx) that had put together a guidebook for Commercial Solutions Openings available to everyone within the Department. DIUx, he explained, is a great test bed as a prototyping incubator that demonstrates that the Commercial Solutions Opening is a tool that can work. DIUx also released a guidebook for the Commercial Solutions Opening tool. He also mentioned the success the Defense Digital Service was witnessing, and that both the Army and Air Force Digital Services were in a launch phase. Related to Recommendation 7, project Jigsaw, a DIUx project, helped General Goldfein and the Air Force get more software engineering data and analytical talent working on warfighter problems. In respect to Recommendation 9, there are examples of leaders in the Services seeing the value of having embedded engineers engaging with end users. Lastly, Mr. Marcuse mentioned LtGen Dana's successful YouTube video campaign that asked for Marines at all levels to contribute creative ideas.

Mr. Marcuse then opened the meeting to questions and comments from the audience.

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### PUBLIC COMMENTS

Audience member Ms. Erin Simpson thanked the Board for their hard work and began by agreeing with ADM McRaven that changing the culture will occur when data becomes useful to the warfighter. She compared the current situation to intelligence in the last 15 years going from a supporting, back of the house endeavor, to being elevated during the war on terror. She also pointed out that the North Korean example is a bad use case for big data because big data is focused on pattern recognition and anomalies over time. She also mentioned that the warfighter, logistics, and acquisitions all have very different use cases for big data, and a one-sized approach is not ideal.

Audience member LTC Ben Taylor, USA, addressed what an operator needs from his perspective as a Special Forces officer. He said he would like to see big data that uses social media analysis and publically available information that can be overlaid with classified intelligence products.

Audience member Mr. Joseph Schuman, from MD5, presented that he would like to see data on what skills people within the Department have. He mentioned that it would be useful to have a dataset that easily allowed people to find each other to collaborate on innovative projects.

Audience member Mr. Jesse Allman, from the Center for Strategic International Studies, mentioned that he had spent the last seven and a half years wrestling with government data, specifically federal procurement data. He noted that the quality of data was often subpar, missing 80-90% of the fields. He also noted that there was little awareness throughout the Department that this public data existed. He continued to say that the querying tools are not

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intuitive nor do they have much functionality.

Audience member Mr. Christopher Thomas mentioned the importance of common identifiers that allow information to be traced and compiled amongst data sets. Even if the Department gathered all of the information together, he warned, it would still have the difficulty of putting the puzzle together.

Audience member Ms. Sarah Soliman began by saying she was representing the Defense Entrepreneurs Forum (DEF), which submitted six total recommended actions for the Defense Innovation Board. She continued to say the most relevant is to lend the Board's star power to develop a culture of valor around computer science to morph public perception that is accustomed to thinking of military heroism on a physical battlefield. She also mentioned that the DoD will have to spend a lot of effort to reverse the statistics of females and minorities in computer science.

Audience member Maj Steven "Rhino" Mwesigwa, USAF, asked the Board to explore how big data can aid complex situations more timely and correct than human interaction. He discussed this in the context of air support and the various factors that go into successfully ensuring a weapon is on target, taking into account ground forces, enemies, and civilians.

Audience member Col Braxton Rehm, USAF, spoke about the future challenges posed by Special Access Program (SAP) data and how classification will be a blocker to data fusion. He spoke of his experience using multiple different computer systems to compile data when he commanded RQ170s.

Audience member CPT Jim Perkins, USA, expressed that he was speaking in a personal capacity as the executive director of the Defense Entrepreneurs Forum. He discussed the importance of the Chief Innovation Officer and recommended that the person should find and connect the silos of excellence and innovation around the Department.

Dr. Schmidt made closing comments.

END OF PUBLIC SESSION

ADJOURNMENT

Mr. Marcuse, with the concurrence of the Designated Federal Officer, adjourned the DIB's April 4, 2017 public meeting session at 11:04 AM.

I hereby certify, to the best of my knowledge, the foregoing minutes are accurate and complete.



Eric Schmidt, Ph.D.  
Chairman, Defense Innovation Board

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### MEETING ATTENDEES:

Mr. Michael Aimone	Mr. Michael Kunkler
Ms. Francine Anderson	Dr. Eric Lander
LTC James Armstrong	Mr. Thomas Larson
Mr. Scott Aughenbaugh	Ms. Roma Laster
Mr. Benjamin Bain	Ms. Allison Lazarus
Mr. Gary Barnabo	Ms. Marne Levine
Mr. John Bergin	Mr. Todd Levine
Mr. Zachary Blanchard	MAJ Christy Licklider
Ms. Suzanna Blume	Ms. Riva Litman
Lt Col Jamison Braun	Mr. Nicolas Lopez
VADM William Brown	Mr. Chris Lynch
Mr. Chris Cadigan	CAPT James Macaranas
Mr. Bryon Callan	Mr. Scott Maucione
LTG Ed Cardon	Mr. Joshua Marcuse
Mr. Daniel Chiu	Mr. Scott McCain
Col Jason Combs	Maj Kaly McKenna
Mr. George Coyle	Dr. J. Michael McQuade
Mr. Ross Dakin	ADM (ret) William McRaven
Ms. Bess Dopkeen	Mr. Milo Medin
Mr. Jeffrey Eggers	Mr. Aaron Mehta
Ms. Samantha Ehlinger	Lt Col Christopher Miller
Mr. Jesse Ellman	Ms. Julia Muedeking
CDR Patrick Evans, USN	Lt Col Christopher Mulder
Ms. Katherine Forbes	Dr. Richard Murray
Ms. Megan Frisk	Maj Steven Mwesigwa
Mr. Adam Frost	Ms. Jennifer Pahlka
Mr. Michael Gable	Ms. Jackie Parziale
Ms. Kaitlyn Garman	Ms. Kaitlin Penry
Col Arnaud Gary	CPT Jim Perkins
Ms. Allison Gervasio	Ms. Terri Phifer
Mr. Christian Gilbert	Col Stephan Pillmeier
Mr. Scott Gooch	BG Imre Porkolab
Mr. James Gurney	Mr. John Quirk
Mr. Mark Hanis	Col Braxton Rehm
Ms. Hillary Harlan	Mr. David Reist
Ms. Kathryn Harris	Mr. Jai Retter
Mr. Alexander Henry	Lt Col James Rowley
Mr. Rich Hicks	Ms. Renelle Sagana
Mr. Mark Hogenmiller	Brig Gen B. Chance Saltzman
Mr. Walter Isaacson	Mr. Will Scales
Mr. Brad Jackson	Dr. Eric Schmidt
Mr. Kevin Kenney	Mr. Aaron Schumacher
Mr. Andrew Kim	Mr. Joe Schuman
Mr. Alex Kravets	Dr. Arun Seraphin
	Mr. Raj Shah
	Ms. Joy Shanaberger

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Lt Gen Jack Shanahan  
Ms. Erin Simpson  
Ms. Sarah Soliman  
Ms. Johanna Spangenberg-Jones  
Mr. Bret Strogon  
Mr. Tim Sussman  
Ms. Morgan Taylor  
LTC Ben Taylor  
Mr. Christopher Thomas  
Mr. Allen Thompson  
Ms. Paula Trimble  
Mr. Walt Turner  
Dr. Neil deGrasse Tyson  
Mr. Kurt Vogel  
Dr. Robert Werko  
Mr. Adam Winkleman  
Capt Chris Wood  
Ms. Sharon Woods  
Mr. Jim Young  
LTC Matt Zais  
Mr. David Zubrow  
Col Jennifer Sovada  
Mrs. Claire Burt  
Mr. Robert Warshel