Data and Defense: How to Boost Readiness

Research Brief

IBM   **govloop**

Introduction

Defense and intelligence agencies want to leverage the data they collect so they can use artificial intelligence to enhance readiness – but most who run these programs don't know how to get started and find it difficult to make the business case to their leadership.

In this research report, created by GovLoop in partnership with IBM, which provides innovative technology solutions for national security and military intelligence, you're going to learn where your peers stand—and some practical tips on how to get started—even if you think your data is "dirty" or not ready for advanced applications.

So what do we mean by readiness? The traditional definition of "readiness" is "the state of being fully prepared for something." In today's military, however, readiness is about so much more.

It's the ability to execute on missions critical to national security and keep the nation's citizens safe. Current readiness enables units to do two things — execute core functions and perform assigned missions. Measuring a variety of data, including various personnel, equipment, equipment serviceability and training statuses, is important to ensuring this readiness.

In short, military readiness is performing missions everywhere, all the time — and it's shaped by many factors.

There are several challenges to readiness, however. But many of these issues are being mitigated with the proper use of data. Agencies and military intelligence professionals rely on data and analytics to anticipate, discover, evaluate and respond in real time.

In this report, we'll share results of a GovLoop survey of 101 DoD and intelligence professionals. For additional insights on defense data and readiness, we spoke with some of IBM's top military data and analytics experts, including Matthew Dalkiewicz, Navy/Marine Corps account manager; Emily K. Fontaine, Solution and Delivery Manager in IBM Global Business Services Public Sector; Brady Moore, Cognitive Solution Manager for IBM's Industry Solutions and Business Development Team; and Kay Murphy, lead for IBM's Global Asset Optimization Center of Competence.

Why Data Is Critical for Defense and Intelligence Readiness

DoD has never been more aware that data is critical to its ongoing and future operations. Dana Deasy, DoD's chief information officer, has put data at the forefront of his plans for moving the military and its capabilities into the future.

"We are currently not lacking in data inside the Department of Defense," he said recently at the DoDIIS Worldwide conference in Omaha, Nebraska, in August. "But it is becoming increasingly apparent we must be mindful of how we use this data. Our challenge at DoD is to discover, access, retrieve, analyze and share all the sources of data whenever and wherever our warfighter needs it. It sounds simple, but we all know, if you break that sentence apart, that is an ambitious undertaking."

Deasy also wants to use the data DoD creates, accesses and stores for artificial intelligence capabilities. He has ordered the creation of the Joint Artificial Intelligence Center (JAIC) with the goal of enabling "teams across DoD to swiftly deliver new AI-enabled capabilities and effectively experiment with new operating concepts in support of DoD's military missions and business functions," according to a memo.

"Data is the common denominator for any successful artificial intelligence program," Deasy said at the event.

But AI cannot succeed without accurate data. The questions DoD faces on this front are:

- *Where is that data?*
- *What is the format of that data?*
- *How do we access that data?*
- *How do we analyze that data to make the right decisions?*

IBM's experts agree, and point to the ability of data to enhance a critical function of the military: field and equipment readiness.

"Military equipment is used for a variety of purposes that support the readiness of our forces to do their jobs," said Kay Murphy, lead for IBM's Global Asset Optimization Center of Competence. "Sometimes, that's to fight a war, do training or any of the myriad things that our armed forces need to protect and defend our country. But what happens if that equipment is breaking down? It puts our soldiers in risky and unsafe situations."

Having the right data and the ability to assess it is crucial in aiding equipment and field readiness, Murphy pointed out.

"There's a lot of data out there already, about how equipment is being used, how often it's being used, the types of situations it's used in, who's using it, as well as maintenance history – and let's not forget all the sensor-enabled equipment the military has, too," she said.

When the military is able to properly ingest, sort, store and analyze data about its equipment and vehicles, it can predict everything from machine failure to maintenance needs before breakdowns happen, saving effort, time, money and possibly lives.

Having the right data at the ready goes beyond equipment readiness as well, said Brady Moore, cognitive solution manager for IBM's Industry Solutions and Business Development Team.

"When you don't have the right data," he said, "it can be difficult to make data-driven decisions."

In DoD, especially in the field, warfighters don't have the luxury of waiting for the right data to arrive, Moore pointed out. "The decision has to get made either way," he said. Because data isn't always readily available for commanders in the field, they sometimes can't incorporate it into their decisions. That's understandable, but it's a decision made on time, not data – and that's not what DoD needs.

So, what does DoD need, and what challenges is it encountering as it works to get critical data that will support its field readiness and its missions? That's what our survey of 101 DoD and intelligence professionals aimed to discover. Let's take a look at the findings.

Survey Results: Cultural, Technical Challenges Blocking Full Potential of Data for Readiness

When public security is jeopardized by a disaster or military threat, defense and intelligence forces need to move from data to decision in minutes.

To assess the state of data at DoD, we asked 101 DoD and intelligence professionals anonymously about everything from the types of data they manage, to challenges they face, barriers in data collaboration and more.

Unfortunately, according to a majority of survey respondents, a variety of obstacles prevent the military from truly accessing and utilizing its data in ways that would enhance its readiness. The survey also revealed that everything from budget issues to leadership and legacy technology prevents them from accessing and analyzing their data, that text is the primary type of data they are currently dealing with, that they are not as empowered as they would like to be when it comes to using data and that they often find the volume of data they must store and analyze to be simply overwhelming.

Types of Data and How It's Gathered

Ninety percent of all data today <u>was created</u> in the last two years – that's 2.5 quintillion bytes of data per day – and, with sensor-enabled technology, that number will only grow. In addition to this massive amount of data, there are several kinds of data created by any organization that are stored in databases. In the early days of computing, data was primarily text and numbers. Today, there are many different multimedia data types, such as audio, images, graphics and video.

Meanwhile, some information, like unstructured data, is not as easy to access and analyze. Unstructured data doesn't conform to formal data models associated with relational databases. It contains only tags or other markers to help separate certain elements. Consider email: it has some structure to it – timestamps and IP addresses, for example – but most of an email's data is unstructured content or text that someone has written. Unstructured data is usually not organized in any predefined manner and is text-heavy. Sometimes, it may contain structured data such as dates, numbers and facts. But unstructured data is especially difficult to sort through because most of the information is based on free-flowing content.

To get a baseline understanding of how our survey respondents interact with all types of data, we asked two questions: what types of data are they managing, and how prepared are they to gather data?

The answers revealed that they are primarily dealing with text data and that respondents are split between being able to access their data easily or not at all (See Figures 1 and 2).

Our experts were not surprised by either of these revelations, particularly given the amount of documentation that exists in text formats that the military must deal with. "There are millions of maintenance manuals and best practices and procedures documentation and acquisition instructions, and so forth," said Murphy. "You can find a massive amount of text data in every aspect of operations within the government, not just in the military."

Moore pointed out that there are essentially two kinds of text data: structured and unstructured. "The structured data is databases, spreadsheets and so forth," he said. "And then there's unstructured, which looks like writing – emails, reports, handwritten notes, PDFs and more. Today, there are no easy ways of being able to access both structured and unstructured data."

Figure 1

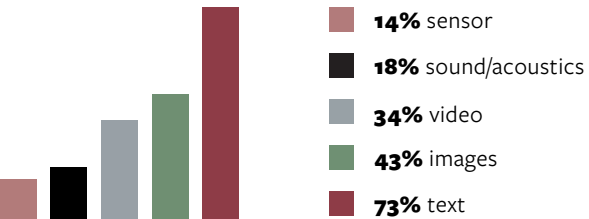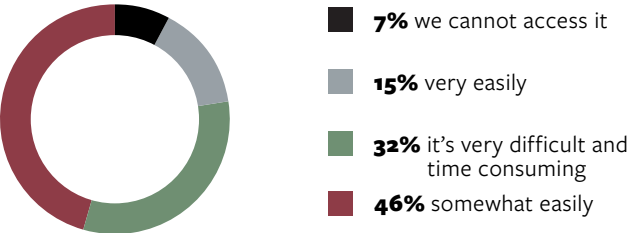**What types of data do you manage outside of traditional systems? (Select all that apply)**

- **14%** sensor
- **18%** sound/acoustics
- **34%** video
- **43%** images
- **73%** text

Figure 2

How able and ready are you to gather your data?

- **7%** we cannot access it
- **15%** very easily
- **32%** it's very difficult and time consuming
- **46%** somewhat easily

Eighty percent of our survey respondents said they dealt with image data (43 percent) or video data (34 percent), and 14 percent said the data they dealt with was from sensors (See Figure 1). Those numbers will only increase as the military enables more of its warfighters to collect visuals and as body cameras become more common in the field.

It's not necessarily surprising that it's difficult for most respondents to get to their data. Today, many of the joint forces have stove-piped command systems and networks with duplicative and non-integrated IT programs. This creates data silos that can make it difficult to have the right person access the right data, at the right time, for the right purpose.

The Challenges of Using Data

To understand more about the challenges DoD professionals face in all manners of interacting with data, we asked several questions about what kinds of obstacles they encountered and whether they felt empowered when it came to accessing data.

According to our survey, the challenges are real and numerous. When asked, "Do you face challenges in using data strategically to ensure your manpower, personnel and equipment are ready to achieve the mission at your agency?" 56 percent said yes, and

16 percent said sometimes (See Figure 3). This means that nearly three-quarters of respondents face obstacles to leveraging data.

The particular challenges ranged from budget issues to leadership buy-in, but the top challenges, according to our respondents, were legacy technology (21 percent); being overwhelmed by the volume of data (15 percent); silos (12 percent) and cultural issues (12 percent) (See Figure 4).

Answers to other questions re-emphasized these findings, such as the fact that 55 percent of survey respondents said their IT resources are overwhelmed by the volume of data they take in (See Figure 5).

Another challenge to strategically using data is a lack of skilled personnel. In a response that revealed critical workforce issues, 62 percent of respondents said their agency does not have people with the skills to analyze data.

All of these answers point to a simple fact: Data is overwhelming DoD systems, people and technology.

Moving toward augmented intelligence – IBM's term that refers to the effective use of information technology in augmenting human intelligence – could help – but it turns out there are challenges to that, too.

Figure 3

Do you face challenges in using data strategically to ensure your manpower, personnel and equipment are ready to achieve the mission at your agency?
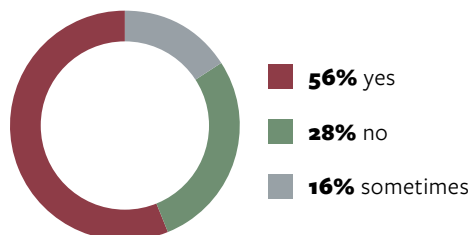
56% yes
28% no
16% sometimes

Figure 5

Is the volume and/or velocity of new data overwhelming your IT resources?

55% yes
45% no
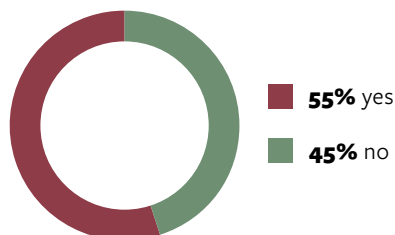
Figure 4

What are the top challenges you face in using data strategically?

8% lack of leadership buy-in
12% silos
12% cultural issues
15% overwhelmed by volume of data
16% budget
16% other
21% legacy technology
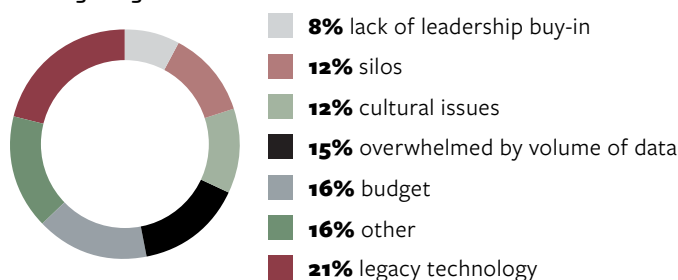
Figure 6

Do you feel your agency has enough people with the skills needed to analyze data?

62% no
23% yes
15% somewhat
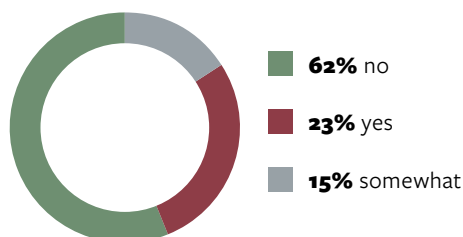
Mission readiness requires close coordination of people, training, supplies and ordinance to ensure forces are ready for any threat. When data is easily accessed, stored and analyzed, it can enable better mission outcomes. Monitoring, maintaining and optimizing assets, predicting asset failure and reducing guesswork are all beneficial outcomes.

Using augmented intelligence – systems that augment human capabilities – DoD can analyze data from multiple sources and provide actionable, timely intelligence.

But, according to our survey, the multiple challenges articulated in the previous section are preventing DoD from fully recognizing this ability. In fact, its current approaches to data management are basic and exist mostly in spreadsheets.

When asked, "Are predictive analytics used at your agency to prepare for readiness and decisions?" 56 percent said no, and of the 45 percent that said yes, only half of those were using advanced analytics and machine learning tools, with the majority using simple spreadsheets (See Figures 7 and 8).

With respect to moving to other new technologies and approaches like augmented intelligence, survey respondents faced a series of hurdles and were not sure they could make the case to their leadership to go forward with these technologies. The largest hurdles? Budget and lack of skills, among others (see Figure 9), caused 52 percent to be unsure if they could effectively use or make the case for advanced analytics and technologies like machine learning (See Figure 10).

Finally, respondents cited leadership issues and politics as primary barriers to addressing problems with machine learning, AI and advanced analytics (See Figure 11).
How best to move forward then? We'll delve more into solutions in our next section, but one approach that Fontaine suggested was focusing more on the outcomes of augmented intelligence rather than pure AI or machine learning.

Augmented intelligence is the idea that artificial intelligence can assist, emphasizing the fact that it is designed to enhance human intelligence rather than replace it.

"Augmented intelligence — or cognitive computing — is about using technology like machine learning or natural language processing to complement humans by helping them do their jobs better, find deeper insights and ultimately make more informed decisions with their data," Fontaine said. "It's about using AI to augment your already-in-place labor force and find

ways to enhance and automate the process. A lot of agencies we see do everything manually from a data analysis standpoint. Our job is to co-create with our clients to develop holistic cognitive solutions that turn data into meaningful information."

Figure 7

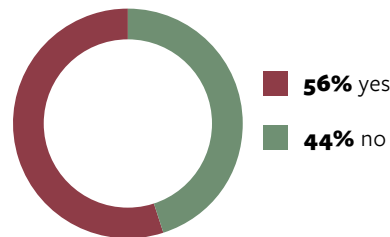**Are predictive analytics used at your agency to prepare for readiness and decisions?**

- **56%** yes
- **44%** no

Figure 8

If you are using predictive analytics, what tools are you using?

- **23%** Advanced Analytics tools (e.g., SPSS, SAS, Jupiter)
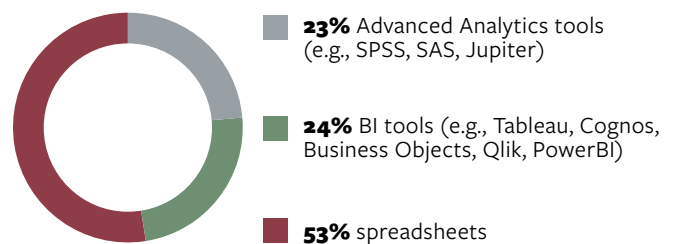- **24%** BI tools (e.g., Tableau, Cognos, Business Objects, Qlik, PowerBI)
- **53%** spreadsheets

Figure 9

What challenges do you have in taking advantage of new technologies like machine learning? (Select top 3)

27% cultural issues

27% not a priority at my agency

31% unsure which technology is best
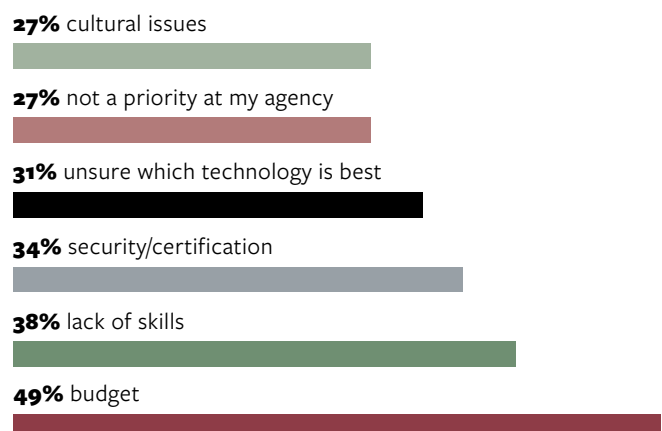
34% security/certification

38% lack of skills

49% budget

Figure 10

Do you believe you can make the business case for artificial intelligence and machine learning at your agency?
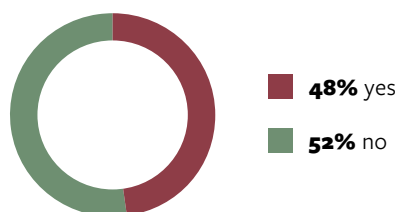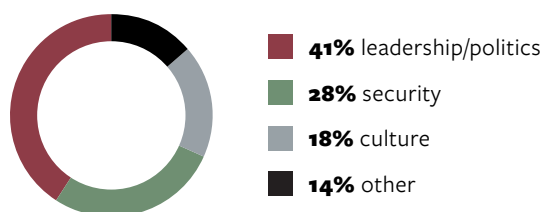

- **48%** yes
- **52%** no

Figure 11

What are the barriers to collaborating with other governmental organizations to solve a problem with analytics and machine learning?

- **41%** leadership/politics
- **28%** security
- **18%** culture
- **14%** other

Best Practices: Handling Data for Readiness and Beyond

To help those struggling with data issues, there are a few best practices that can get IT teams started on a better path to data readiness.

Start small with your data – but start:
Where can you be successful in a small way by proving the worth of having data at the ready? "We always tell people, don't try to boil the ocean," said Fontaine. "Start small and be successful. Then build on that success. Focus on the solution, not the product."

Added Moore, "When we have customers who have this idea about 'data perfection,' that they better get their data right before they do anything else, we tell them that the way to get around that is to shrink the problem they're trying to solve as much as they can, set good parameters, and set good metrics for success. And then just get started, because success breeds success."

Create a data governance strategy:
Data governance means managing data by revising it to standardize it and bring consistency to the way it is used across numerous initiatives. Data governance also ensures that critical data is available to the right people at the right time in a standardized and reliable form. "To start, ask yourself, what are those key elements of data that you absolutely know you need for your business to perform correctly?" said Dalkiewicz. "Then, segment and go from there."

Look into deploying a knowledge management layer:
Data is important, but not useful if you can't interpret it. Knowledge management systems can make sure information is analyzed, reported, modeled and monitored to access

knowledge. "Having a knowledge management layer on top of all of your data that allows you to use something like natural language processing to better find the information that takes context into account is critical," said Moore.

Realize executive buy-in is the key to removing silos:
"Where I've seen organizations truly take advantage of data is when a higher-level leader looks at the situation and endorses and directs the mission," Moore said. Across departments, the buy-in of a senior leader can force cooperation between both organizations and data-sharing when needed.

Invest in augmented intelligence:
You hear a lot about artificial intelligence, but Fontaine says governments need to think instead about augmented intelligence. It's not about replacing the data analysts or managers – it's about supporting them with the right information. It's the humans who make the final decisions. "Augmented intelligence enhances human capability rather than replacing it. AI, or cognitive systems, functions much as a human does, with an ability to understand, reason and learn. This makes for seamless integration and a comfortable partnership between humans and machines. With the meaningful data insights AI provides, humans are more well-equipped decision-makers," she said. "Machine learning, computer vision, natural language processing and automation are valuable tools to help the government operate more effectively and efficiently. With cognitive computing we can solve problems that we were unable to solve in the past."

Partner with the right vendor:
Having a partner who can critically assess where you are in your data journey and help move you to the next step is important. "IBM is here to augment your data and your information and to support you in your mission," said Dalkiewicz. IBM helps governments worldwide provide for and protect their citizens with analytic solutions spanning the wide range of government responsibilities, including public safety, defense, national intelligence, social programs, cybersecurity and finance and operations.

Case Study:
How Data Plus Artificial Intelligence Is Helping the Army Streamline Cargo Delivery

DoD transports millions of tons of cargo over air, land and sea every day. To get a sense of that scope, think about this: An Air Force Boeing C-17 carries a maximum of 77 tons. Just 1 million tons would require about 14,000 of these planes.

Because some of this cargo is vital to military operations worldwide, it must be delivered as fast as possible. Getting critical shipments — such as military vehicle repair parts — where they need to go can mean the difference between winning and losing a battle. Likewise, specialized medical supplies and blood products must arrive where they're needed, when they're needed, as lives literally depend on them.

So how do the logistics to prioritize this volume of cargo get prioritized? A group of Army specialists known as the Army Airlift Clearance Authority (AACA) helps determine whether and when shipping by air makes the most sense. AACA's mission is to make sure the highest-priority items, such as engines and transmissions, get sent by air efficiently and effectively.

In 2016, AACA received approximately 260,000 requests for air travel, requiring substantial time and labor to evaluate and meet these high-priority demands. In addition, AACA didn't receive about 55,000 additional requests that, therefore, did not get processed.

To help get over these obstacles and help the AACA's ability to process requests, the Army invested in a three-week pilot using IBM Watson artificial intelligence (AI) services. AACA wanted to determine whether it could find less costly transportation — such as ground or sea — instead of costlier air transportation.

IBM "fed" Watson 55,000 transportation requests from 2016 — just a small portion of the total requests from that year — and, in three weeks, taught the system how to interpret this data using AACA's metrics.

"It would've taken AACA three to four months to process the 55,000 requests," said Joe Corleto, IBM Army Readiness Program Manager. "It took IBM Watson a little more than an hour."

Watson identified $26 million in cost avoidance in 2016, which would have saved an impressive 30 percent of total costs had they used AI that year instead of just humans alone. And, while the AACA found $94 million in cost avoidance for fiscal year 2016 through its normal operations, having a Watson AI capability could have generated more than $120 million in cost avoidance to the Army's second-destination transportation fund.

But it's about more than money; it's about readiness and ensuring soldiers have what they need to win. "This pilot has helped demonstrate the Army's ability to make good decisions from tons of data," Corleto said. "Good decisions in the military mean lives saved and missions accomplished."P

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>
> — Joe Corleto, Manager, IBM Army Readiness Program

Case Study:
Marines and Human Capital Readiness

Readiness and AI aren't just about vehicle maintenance, but also about people and human capital. Nobody knows this better than the Marines. They are now using the same IBM Watson predictive analytical capability that diagnoses the health and readiness of military vehicles and applying natural language processing and data science to the organization and deployment of people. The custom dashboard allows commanders to see the readiness level (skills, length of current deployment, distance from battle zone) of the units on a single pane of glass, to aid their decision-making, getting the right people to the right place at the right time. The real breakthrough will come with optimization and prediction: technologies like this will eventually go beyond analysis and be able to actually recommend courses of action, which means faster and more precise decision-making. The system could tell a commander and staff the best moves to make before they know they need to make them, even predicting the need for a surge in recruitment of new Marines who won't even be ready to deploy for years.

How IBM Helps

Agencies and military intelligence professionals rely on data and analytics to anticipate, discover, evaluate and respond in real time. This requires the ability to connect the dots under severe time constraints while coordinating activity with partners. IBM offers defense solutions to empower the threat analyst or mission personnel while balancing privacy, security and legal concerns with mission effectiveness. While data is the opportunity of our time, IBM also understands the importance of managing data and prides itself on a long history of responsible practices.

IBM can address fleet readiness and maintenance with AI systems that ingest maintenance records and manuals, read sensors and aggregate structured and unstructured data to provide real-time information about a fleet's health and maintenance schedule.

In cybersecurity, IBM's AI systems' advantages include employing advanced machine learning to detect threat attack vectors and tradecraft; utilizing and deriving insights from non-traditional cyber sources to augment classic cyber detection and intelligence analysis; enabling intuitive, natural language interfaces from which CISOs and security operations center analysts can derive intelligence amplification; ingesting and analyzing massive amounts of real-time and historical data; and providing real-time recommendations and courses of action to remediate and minimize cyberattacks.

Using IBM's imagery analysis, operators can analyze drone images in more detail than is possible with the human eye. The AI-enabled Internet of Things can identify areas of concern — damage assessment, aircraft and terrain inspection, for example — so that users can determine whether, when and how to address them. This is just a small sample of what IBM has done for their defense and intelligence clients.

Conclusion

In the military, leaders must get their people and their equipment ready to deploy — even before they need to be. Equipment, personnel and overall readiness is imperative for the military of today and of the future. Military asset readiness speaks to more than the uptime, health and availability of equipment; a well-maintained, mission-capable asset saves money, time and lives.

But what we've seen in the GovLoop survey is that the military faces serious challenges in accessing, utilizing and analyzing its data in order to create a scenario of utmost readiness. It is difficult to access the data and they face all types of challenges, from lack of leadership on the issue, to workforce training issues, to legacy technology, to a simple overwhelming of data as they take in the constant stream of information coming their way.

So, in a world with millions of data points and struggles with training, leadership and budget what is to be done?

One way is to partner with a trusted vendor that can help you focus more on the outcomes of augmented intelligence rather than pure AI or machine learning – understanding that artificial intelligence can be assistive, emphasizing the fact that it is designed to enhance human intelligence rather than replace it, to develop holistic cognitive solutions that turn data into meaningful information that impact your readiness.

The true way forward for the military in achieving the readiness it needs to protect and serve the country is accurate, reliable data that is stored securely, accessed easily and analyzed with the right technologies and capabilities. Uptime and asset availability are crucial to mission success across the armed forces. By working to overcome challenges to data readiness with the right cultural approach, technologies and a trusted vendor, DoD can make its way securely into the future.

About IBM

We're helping defense and intel agencies harness their data and apply AI. Compelling applications for defense include fleet readiness and maintenance, cybersecurity, imagery analysis and situational understanding. Are you ready?

For more information, visit us at ibm.com/national-security.

See how your own agency measures up at:
www.ibm.com/industries/federal/resources/military-ai-assessment

About GovLoop

GovLoop's mission is to "connect government to improve government." We aim to inspire public-sector professionals by serving as the knowledge network for government. GovLoop connects more than 270,000 members, fostering cross-government collaboration, solving common problems and advancing government careers. GovLoop is headquartered in Washington, D.C., with a team of dedicated professionals who share a commitment to connect and improve government.

For more information about this report, please reach out to info@govloop.com.
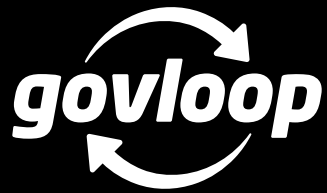
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