BRIDGING THE GAP IN DATA SKILLS

by Chief Warrant Officer 2 Jon Delima
and Chief Warrant Officer 2 Matt Olrogg

The listing of products and services in this article does not imply any endorsement by the U.S. Army, the U.S. Army Intelligence Center of Excellence, or any U.S. government agency.

Introduction

Rapidly evolving information technology exacerbates commanders' uncertainty while they prepare for large-scale combat operations. Data overload is now pervasive as the Army has shifted its operating concept from unified land operations to multidomain operations. Intelligence professionals across all echelons must extrapolate a staggering amount of data from operational environments consisting of five domains (land, maritime, air, space, and cyberspace) and three dimensions (physical, information, and human). Despite this vast amount of data, the task for intelligence professionals remains unchanged: they must strive to understand and visualize the operational environment, regardless of the requisite data literacy skills.

The requirement to keep pace with ever-changing technology has resulted in a skills gap that degrades organizations' abilities to conduct analysis sucessfully.[1] Incorporating data literacy into organizational culture and operational training can minimize the gap for both Soldiers and analysts. Advancements in technology continue to bring new capabilities and materiel solutions for tackling data, but Soldiers require foundational knowledge to employ these tools appropriately and to their full potential.

In early 2022, the 1st Brigade Combat Team (BCT), 10th Mountain Division (Light Infantry) deployed to support Combined Joint Task Force–Operation Inherent Resolve. Although the brigade intelligence support element (BISE) was trained in the doctrine and concepts for near-peer threats and traditional counterinsurgency, the BISE analysts were not prepared to sift efficiently through the vast amounts of data involving multiple state and non-state actors that comprised the adversaries operating in Central Command's area of responsibility.

Big data—"data that contains greater variety, arriving in increasing volumes and with more velocity"[2]—has continued to outpace analysts' ability to ingest information in a modern conflict. Further complicating matters, the BCT was dispersed across four countries, with units using various command and control systems and transport platforms. The BCT, therefore, needed a digital system common to all warfighting functions that was easy to learn and simple to deploy, while simultaneously allowing users to ingest and understand the vast amount of data that drives decision making. One specific area that captures the scope of the challenge is data visualization, which is critical for developing and managing a robust common intelligence picture and common operational picture.

In late 2021, anticipating the complex data environment, the BCT employed personnel and equipment to start a rapid training cycle focused on near-peer, large-scale combat operations. The BCT's intelligence structure and task organization led to strained command relationships and communications challenges between the BISE and the brigade's military intelligence (MI) company. Integrating the BISE's geospatial engineers and the MI company's geospatial intelligence (GEOINT) imagery analysts into one comprehensive GEOINT cell helped mitigate these challenges. The BCT's geospatial engineering technician managed the GEOINT cell's training and personnel development. The simultaneous training of engineers and analysts resulted in a successful Military Intelligence Training Strategy progression that prepared the Soldiers for deployment. This training structure also exposed the BISE to the National Geospatial-Intelligence Agency's Odyssey Program.[3]

The Odyssey Program: Portal for ArcGIS

The Odyssey Program rapidly delivers GEOINT technology and capabilities to disadvantaged and disconnected users. One of the Odyssey Program's many software applications is Portal for ArcGIS (commonly known as Portal).[4] Although Portal is designed specifically for geospatial data, there were clear opportunities to use its data visualization suite across all the BCT's warfighting functions. This enabled the commander to make data-driven decisions. Portal for ArcGIS allowed users to—

- Manipulate and visualize geospatial data.
- Create and share maps and applications across the enterprise, providing subordinate staff with an added toolkit to understand, visualize, and describe the operational environment.
- Disseminate data and increase continuity during unit transitions and rotations (attributable to Portal's general user interface and cloud-based infrastructure).
- Access data stored on Portal's databases from any enclave.

Supporting the Intelligence Warfighting Function. Portal effectively supported the brigade's ability to create a common intelligence picture and provide a dissemination service. The BISE developed and maintained all-source intelligence and GEOINT dashboards. The following paragraphs detail how the BISE used Portal in support of each of the four intelligence warfighting function tasks, which are described in FM 2-0, *Intelligence.*

Provide Intelligence Support to Force Generation.[5] Portal was critical to establishing an intelligence architecture by enabling intelligence reach through rapid dissemination, establishing and maintaining access for users in assigned groups, and acting as the primary intelligence database for analytic production.

Provide Support to Situational Understanding.[6] Portal dashboards were essential to performing situation development by providing current intelligence through significant activity roll-ups, providing threat locations by geospatially depicting the ground order of battle, and developing indicators of threat intentions through data-driven trend analysis.

Conduct Information Collection.[7] Portal dashboards were vital to collection management, serving as the primary location to host all collection management tools. Internal and external organizations could easily access daily information collection synchronization matrices, information collection overlays, feature classes in named areas of interest, end-of-mission products, and imagery interpretation reports.

Provide Intelligence Support to Targeting.[8] Portal was crucial to providing intelligence support to targeting, directly supporting the fires, public affairs, and cyberspace electromagnetic activities (CEMA) sections. Portal provided a single repository of structured intelligence data that allowed these sections to query and conduct further analysis to support targeting operations for lethal and nonlethal effects.

Supporting Other Warfighting Functions. Other warfighting functions within the BCT utilized Portal in a way comparable to that of the intelligence enterprise. Sections were tasked with maintaining running estimates on individual dashboards as an alternative to traditional, unstructured methods and products. Dynamic running estimates provided the brigade commander with transparency and continuous updates without necessarily relying on scheduled battle update briefs or synchronization meetings. Portal served as the primary means of command and control and provided a single system where all warfighting functions could effectively integrate across echelons.

Movement and Maneuver. The operations section maintained a dashboard that projected friendly forces and displayed future operations. Additionally, the operations dashboard hosted the concept of operations products, significant event storyboards, and operation orders, which adjacent, subordinate, and higher echelons could access.

Fires. The fires section maintained a dashboard that visualized the location, readiness status, and range of critical fires support systems throughout the area of operations. Preapproved contingency target locations were also depicted on the dashboard, which assisted in deconflicting operations with internal and external organizations.

Sustainment. The sustainment section developed three distinct dashboards containing logistics, resource management, and medical operations estimates. The logistics dashboard detailed the locations of all sustainment nodes in the theater, the status of ground lines of communication, and the maintenance readiness statuses of critical assets. Resource management tracked each subordinate unit's expenditures and current operational needs statements funded or processed. Medical operations depicted all medical facilities categorized by roles, medical evacuation air asset locations, and disease and non-battle injury trend analysis based on geographic location.

Protection. The protection section established three dashboards, providing estimates of the brigade's engineer, CEMA section, and air and missile defense cell. The engineer dashboard displayed completed, ongoing, and future projects. The CEMA section used its dashboard to depict electromagnetic warfare equipment's readiness status and geographically display electromagnetic interference densities. The air and missile defense cell visualized the location, readiness status, and range of critical counter-unmanned aircraft systems throughout the area of operations. Additionally, the air and missile defense cell's dashboard hosted the brigade's counter-unmanned aircraft systems battle drills and tactics, techniques, and procedures, providing an accessible repository for all outstations and their base defense operations centers.

Operational Impact

When asked how the single common digital system impacted operations, COL Brian Ducote, Commander, 1st Brigade Combat Team, 10th Mountain Division (Light Infantry) stated:

> *By employing Portal's digital dashboards, our organization fundamentally transformed how we effectively visualized, described, and directed operations. Each warfighting function's digital running estimates were maintained on Portal, allowing primary staff officers to tailor a variety of data sources and display what was important in a manner that best resonated with end users. The level of ownership, accuracy, and relevancy of the information drastically increased through this methodology [and] greatly enabled my decisions. As opposed to outdated and redundant information on an antiquated slide, everyone had immediate, real-time access to updated and relevant information. Maintaining this information in one central location enhanced our ability to collect, create, and maintain information to improve our situational understanding of a complex area of operation. Insights gained from the staff's dashboards enabled quick, data-driven decisions, increased candid communication, and resulted in a more synchronized staff.*

Data Literacy

Using a singular digital platform that can process data and comprehensively encompass all warfighting functions can enhance the Army's ability to generate and apply combat power within an ever-evolving operational environment. However, adopting a data processing platform or application must accompany the foundational knowledge of data skills. Implementing data skills training in the institutional domain will take time. In the operational domain, however, units can begin exposing and training their Soldiers to use data effectively by focusing on data literacy.

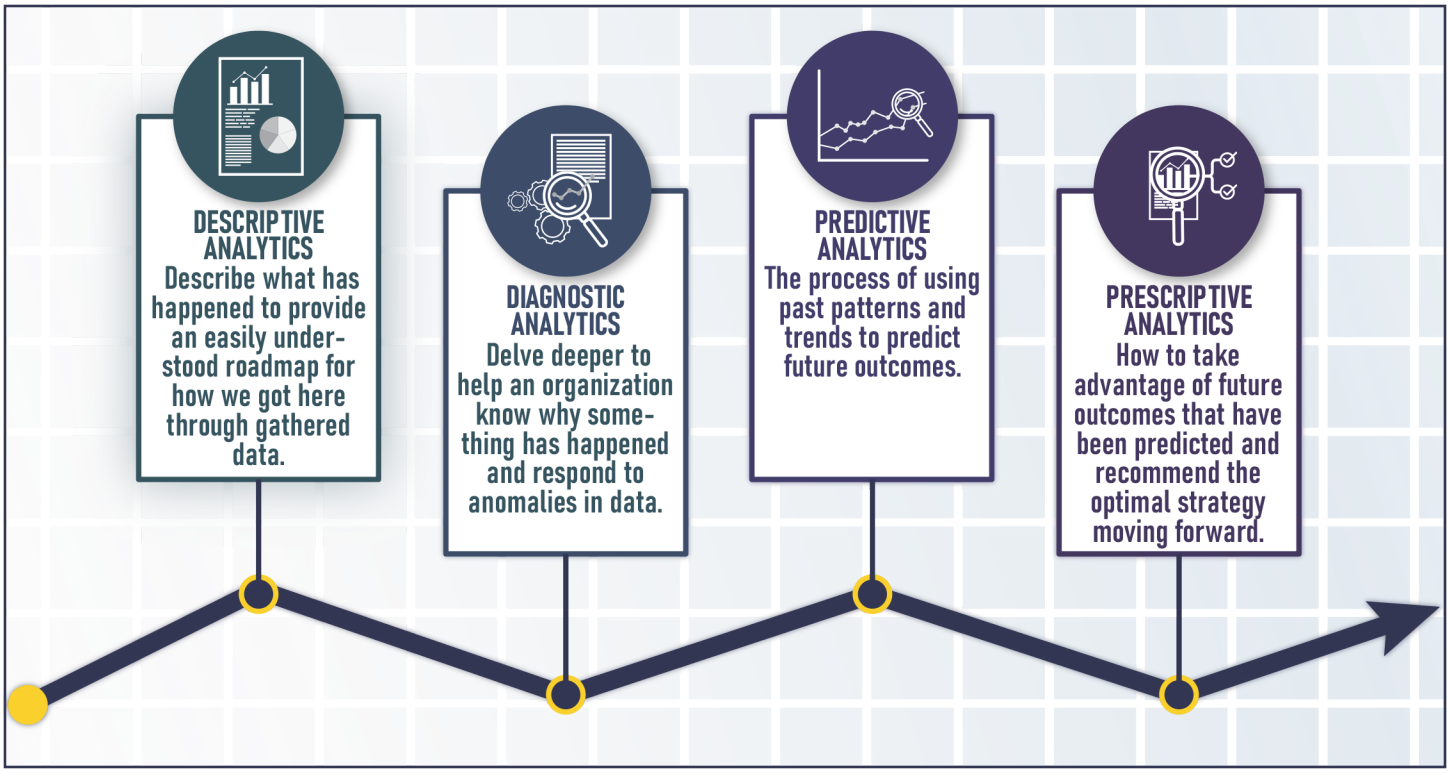
The most common definition of data literacy is "the ability to read, work with, analyze, and argue with data."[9] In his book, *Be Data Literate*, Jordan Morrow proposes changing *argue* with data to *communicate* with data.[10] Intelligence professionals at all echelons can certainly argue analytic assessments using recognized terms of likelihood. Communicating with data, however, can be an effective method of showing your work when explaining why an assessment has changed from *likely* to *most likely*. Communicating with data can ultimately give analysts and their commanders more confidence in making data-driven decisions.

Jordan Morrow describes four levels of analytics (see figure below):

- Descriptive.
- Diagnostic.
- Predictive.
- Prescriptive.

Intelligence sections at all echelons perform these four analytic functions. FM 2-0, and ATP 2-33.4, *Intelligence Analysis*, describe similar principles to Morrow's ideas.[11]

Descriptive. "Descriptive analytics is the building of reports, dashboards, and observations that help an organization know what has happened…or what is currently happening."[12]Much of an intelligence section's work falls within this level of analytics. Intelligence summaries, running estimates, and storyboards all contribute to intelligence warfighting task 2.2, Provide Support to Situational Understanding.[13]



Four Levels of Analytics.[14]

Diagnostic. "Diagnostic analytics is getting the insight in the data, learning the drivers, and why things happened."[15] For military intelligence porfessionals, Morrow's diagnostic analytics are similar to critical factors analysis, which ATP 2-33.4 describes as a framework to help analysts identify threat critical capabilities, threat critical requirements, and threat critical vulnerabilities along with aiding in identifying threat centers of gravity. This framework helps define why the threat operates a certain way and supports recognizing windows of opportunity and threat vulnerabilities.[16]

Predictive. Morrow's idea of predictive analysis is synonymous with that found in Army military intelligence. Still, Morrow goes further and identifies one common trend within military intelligence organizations: analysts are often stuck at descriptive analysis and never get to a predictive level.[17] Analysts frequently spend a good amount of time creating a visually appealing product and only contribute one to two sentences of predictive analysis.

Prescriptive. "Prescriptive analytics is where the technology itself is telling the organization what to do."[18] With the arrival of artificial intelligence and machine learning technologies, the Army is trending toward fielding programs that are prescriptive solutions. While algorithms can certainly aid the analytic effort, intelligence analysts will still need a solid foundation in all levels of analytics to assess our machine counterparts' efforts critically.[19]

Becoming data literate without confusing one's audience with technical jargon is difficult. The issue calls for a deep understanding of current doctrine and policy. Future revisions should embrace the common language used in the larger data community and the ever-evolving technology. Applying academic data literacy concepts to doctrine and training will decrease the data skills gap and help the intelligence community and the Army stay on top of modern problems such as big data. For the intelligence community, familiarizing analysts with these concepts can help build solid foundations for analytic production. Basic analytic techniques, such as sorting and building chronologies, are the cornerstones that drive prescriptive analysis. Advanced analytic techniques, such as high-impact, low-probability analysis and red hat/red team analysis, can help generate predictive analysis and develop more robust likely courses of action.

Conclusion

FM 3-0, *Operations*, states, "Knowledge of the operational environment is the precursor to effective action.… Information collected from multiple sources and analyzed becomes intelligence that answers commanders' intelligence requirements."[20] With the advent of big data, the modern warfighter will need to expand their technical abilities to ingest and analyze data. The internet of things concept, described as "the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves,"[21] will apply in modern conflicts fought with developing technologies. To maintain the tactical advantage, Soldiers must increase their data skills and leverage those skills in complex and dispersed battlespaces.

Endnotes

1. Jordan Morrow, *Be Data Literate: The Data Literacy Skills Everyone Needs to Succeed*, 1st ed. (London: Kogan Page, 2021), 9.

2. Sherry Tiao, "What is Big Data," Oracle Cloud Infrastructure, Oracle, March 11, 2024, https://www.oracle.com/big-data/what-is-big-data/.

3.National Geospatial-Intelligence Agency, *Odyssey: Edge-Accessible GEOINT Data Tools*, 2022, https://www.nga.mil/assets/files/Odyssey_Slicksheet.pdf.

4. Portal for ArcGIS is a software technology component that is the exclusive property of Environmental Systems Research Institute, Inc. (Esri).

5. Department of the Army, Field Manual (FM) 2-0, *Intelligence* (Washington, DC: U.S. Government Publishing Office [GPO], 1 October 2023), B-1–B-5.

6. Ibid., B-5–B-15.

7. Ibid., B-15–B-20.

8. Ibid., B-21–B-24.

9. Rahul Bhargava et al., "Data Murals: Using the Arts to Build Data Literacy," *The Journal of Community Informatics* 12, No.3 (2016): 197-216, https://doi.org/10.15353/joci.v12i3.3285.

10. Morrow, *Be Data Literate*, 36.

11. Department of the Army, FM 2-0, *Intelligence*, 1-4; Department of the Army, "Part Two: Task Techniques" in Army Techniques Publication (ATP) 2-33.4, *Intelligence Analysis* (Washington, DC: U.S. GPO, 10 January 2020), 4-1–6-12.

12. Morrow, *Be Data Literate*, 21.

13. Department of the Army, FM 2-0, *Intelligence*, B-5–B-15.

14. "Explain Descriptive, Diagnostic, Predictive, and Prescriptive Analytics," April 27, 2023, Learning Innovations Branch, https://lwntube.army.mil/webapps/imi/libicoe/data-literacy/explain-analytics/.

15. Morrow, *Be Data Literate, 24*.

16. Department of the Army, ATP 2-33.4, *Intelligence Analysis*, 6-9–6-10.

17. Morrow, *Be Data Literate*, 22.

18. Ibid, 33.

19. Department of the Army, FM 2-0, *Intelligence*, 1-13.

20. Department of the Army, FM 3-0, *Operations* (Washington, DC: U.S. GPO, 1 October 2022), 1-17.

21. "What is IoT (Internet of Things)?" Amazon Web Services, https://aws.amazon.com/what-is/iot/.

CW2 Jon Delima is an all-source intelligence observer, coach, and trainer at the Joint Readiness Training Center, Fort Johnson, LA. His previous assignments include brigade intelligence support element chief for 1st Brigade Combat Team, 10th Mountain Division (Light Infantry); doctrine writer and instructor for the Directorate of Doctrine and Intelligence Systems Training; and battalion S-2 noncommissioned officer in charge for 2nd Battalion, 12th Infantry Regiment, 2nd Stryker Brigade Combat Team, 4th Infantry Division. He holds a bachelor's degree in data analytics and is currently working toward a master's degree in analytics in computational data.

CW2 Matthew Olrogg is an observer, coach, and trainer at the Joint Readiness Training Center, Fort Johnson, LA. His previous assignments include geospatial intelligence (GEOINT) officer in charge for 1st Brigade Combat Team, 10th Mountain Division (Light Infantry), instructor for the Army GEOINT Battalion and National Geospatial-Intelligence Agency under the GEOINT Career Advancement Program. He holds a bachelor's degree in geography and is working toward a master's degree in data science.