Sgt. Keith Bradley, a sniper with Alpha Company, 1st Battalion, 17th Infantry Regiment, mans an M-107 .50-caliber long-range sniper rifle to search for enemy presence 10 February 2010 during Operation Helmand Spider in Badula Qulp, Helmand Province, Afghanistan. Soldiers remain critical for decision dominance because humans deal with ambiguity better than machines; automation enhances human performance but does not replace it. (Photo by Tech. Sgt. Efren Lopez, U.S. Air Force)

Command Post Automation

Col. Harry D. Tunnell IV, PhD, U.S. Army, Retired

Decision dominance is "the ability of the commander to sense, understand, decide, act, and assess faster and more effectively than any adversary."

—Gen. John "Mike" Murray

Command post automation applies digital technologies to improve speed and quality of processes in a tactically meaningful way. The idea of decision dominance is enabled by command posts, and the technology necessary to achieve it in command post operations is available today. However, today's

"modern" command post is not really modern at all and lacks the infrastructure for decision dominance. True, command posts have computers and electronic data is common, but managing the staff processes essential for getting fighting units to act relies on arcane manual processes rather than modern automated ones.

Unfortunately, too many senior leaders are not focused on the types of foundational systems necessary to support decision dominance today. Instead, they focus on advanced technologies that will likely not mature for decades. Artificial intelligence (AI), the idea that machines can mimic human cognitive processes, is an example. But Army interests will not be served by AI anytime soon. Dr. Michael Jordan, an AI pioneer, explains that computers will not be able to reason abstractly about real-life situations like humans can for the foreseeable future.[1] If the Army wants to create computing solutions to improve capability for soldiers *today*, Army leaders should focus on current opportunities such as automation rather than expensive immature ideas that will not be able to scale for generations.

Standard processes in command posts, such as the military decision-making process (MDMP), can sometimes be poorly executed, resulting in misunderstood tactical tasks, poor coordination, and a lack of timely execution. Automation, on the other hand, promotes faster execution of repeatable tasks and minimizes errors. These positive attributes can contribute to better outcomes in tactical formations.

When breaking down the idea of decision dominance, there are three challenges that command post technology can help solve. First is to sense and understand the environment. This is enabled by capturing data with sensors and other technology that is reported back to the command post for analysis. Second is to decide. This is enabled by converting the captured data into information and knowledge and presenting it to leaders in easy-to-consume ways. Third is to act and assess. This is enabled by reliable document management and workflow practices to manage and distribute knowledge so that leaders can move in a continual intellectual loop of action and assessment.

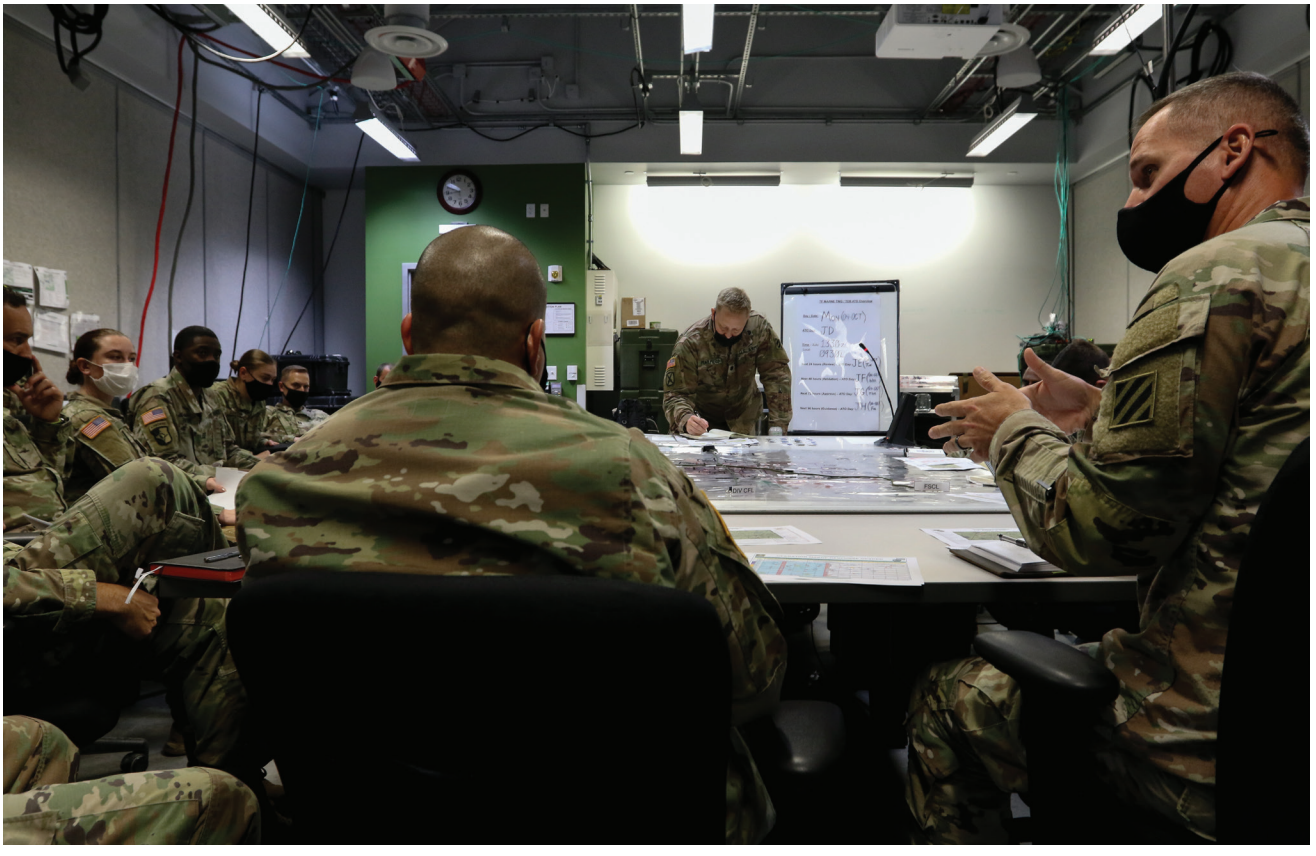
This article is the last in a trilogy about command post operations in the digital age. The first article describes a theoretical framework that enables information age tactical operations based upon network-centric warfare theory.[2] The theoretical framework can be used to identify options and create processes, systems, and tools for solving the three challenges of decision dominance. The second article describes a tactical data science practice for command posts and outlines a training program to improve digital skills throughout the Army.[3] Tactical data science teams in command posts combined with Army enterprise-wide digital skills offer a practical solution for challenges one and two.

This article provides a vision for how to solve the third challenge. Tools such as electronic document management systems are increasingly common in business. They can be applied in a military context to enable a commander's ability to act and assess faster than an adversary. Electronic document management systems are cloud-based enterprise software used to manage and store records. The advantages of the systems are that they can improve access to and standardization of records, implement metadata to improve findability, configure security controls to safeguard information as it goes through a process, and apply workflows to ensure that process steps are not overlooked or ignored.

The Value of Command Post Automation

The value of an enterprise-wide ability to act and assess faster than an adversary is obvious. The question is how to obtain this value. Modernization of command post operations enables action and assessment by improving the speed and quality of common tasks such as the production and issue of combat orders. The idea of electronic document management began to gain traction during the 1990s. It was becoming obvious that managing documentation this way would contribute to business value in ways such as improving communication of

Col. Harry D. Tunnell IV, PhD, U.S. Army, retired, is the information technology senior director for Clinical Operations/Digital Solutions at Eli Lilly and Company and an adjunct lecturer in the Department of Human-Centered Computing at Indiana University–Purdue University Indianapolis. Tunnell is a West Point graduate who commanded 1st Battalion (Airborne), 508th Infantry in Iraq and 5th Stryker Brigade Combat Team, 2nd Infantry Division in Afghanistan. He is a senior member of the Institute of Electrical and Electronics Engineers.



Soldiers from warfighting functions throughout the 3rd Infantry Division participate in a targeting working group during Warfighter 22-1 in the Mission Training Center on Fort Stewart, Georgia, 4 October 2021. Most command posts are not modern. Leaders still rely on century-old technologies and antiquated processes such as paper maps, physical overlays, and manual staff processes. (Photo by Sgt. 1st Class Jason Hull, U.S. Army)

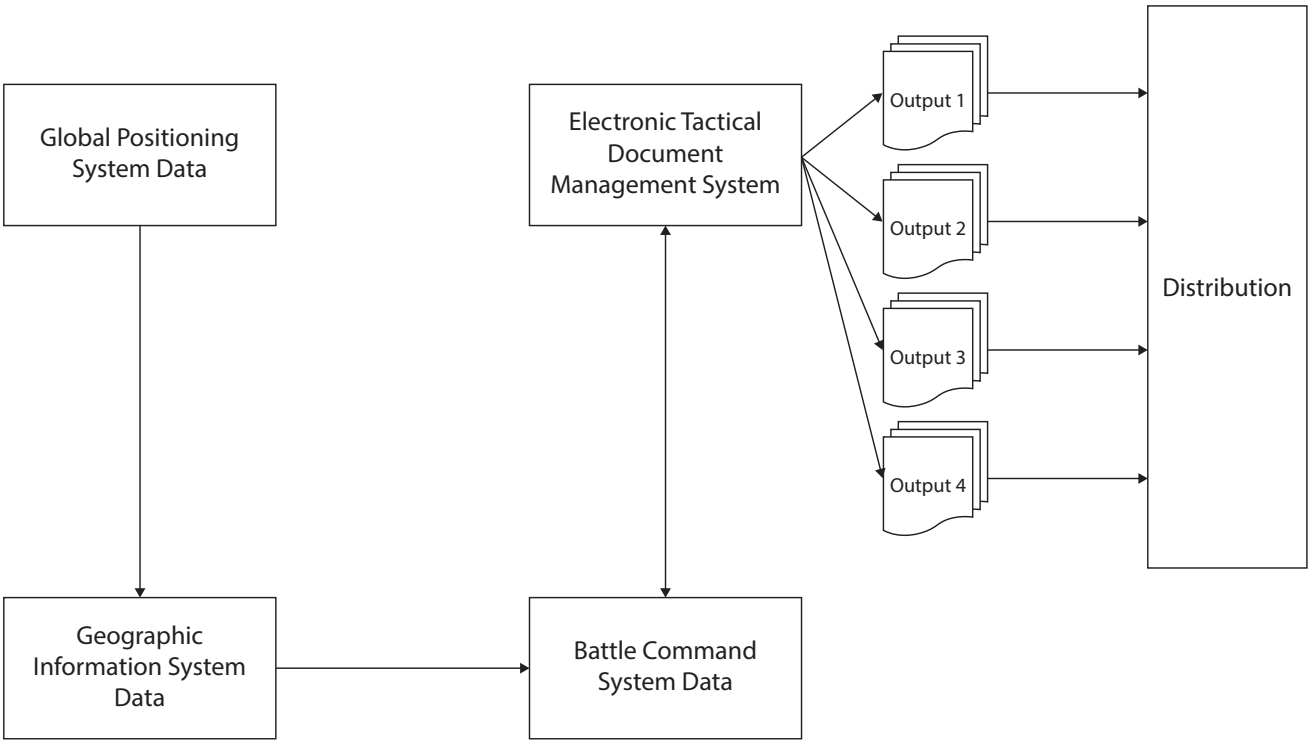
concepts and ideas, increasing productivity of business processes, and leveraging organizational memory to improve productivity and performance.[4]

Advanced future technologies such as AI will not improve processes such as MDMP—the single most important process to get Army formations to act against an enemy. Consequently, to achieve decision dominance, formations need to act faster, and they will only act faster if orders are faster and of better quality, which requires significantly improved *management* of the process that gets formations to act. In the digital world, faster management of processes means electronic document management systems.

Ideas to automate or semiautomate MDMP are not new.[5] What is novel about the automation approach herein is that it can be applied to most doctrinal processes in command posts. Brigade-level MDMP is merely the use case described in this article. And that leads to another value of an electronic document management system—it can be configured to support *many different* processes. A custom system is not required for each process.

Among the major improvements in command posts since the end of the Cold War are the conversion of paper documents to electronic, web portals, digital battle command systems, and computing devices throughout command posts. However, none of these advancements truly enable processes; they are stovepiped innovations. The information and single-use processes they support are poorly integrated or not integrated at all. Consequently, it is difficult to perform an end-to-end multidisciplinary process such as MDMP using them. Furthermore, even with the numerous technologies in command posts, documents are still lost, processes are manually tracked, quality control is minimal or nonexistent, and document security is not managed well.

Advancements in automation have reduced the need for human intervention in some tasks. The advancements combine rules-based approaches that are highly repeatable with modern information approaches such as machine learning. This is a powerful



(Figure by author)

Figure 1. Electronic Tactical Document Management System Example

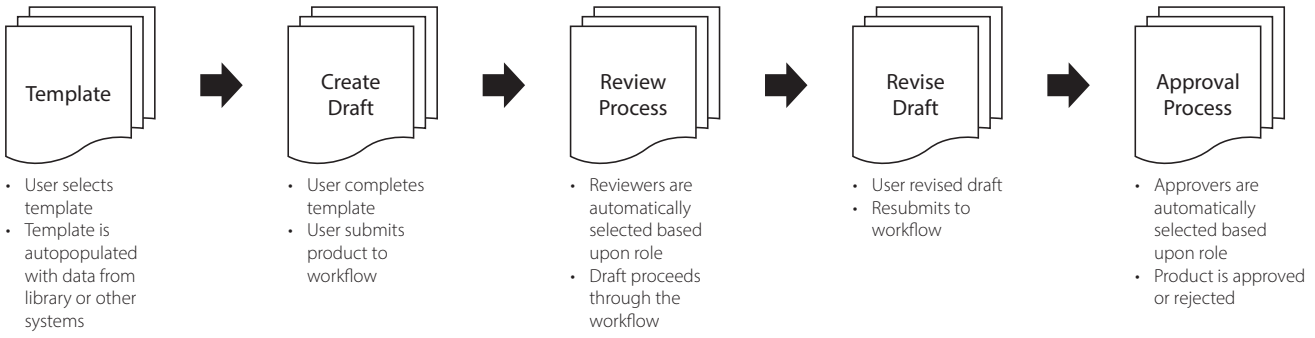
combination that makes processes efficient in terms of timeliness and improves the quality of decisions by surfacing insights from data to leaders.

Business process management (BPM) techniques can be used to identify opportunities for workflow automation. During BPM, process maps are created to provide an overview of process steps, visualize critical relations between them, and evoke an understanding of the organization's operations.[6] Process maps are diagrammatic and often static representations that are useful for process improvement.[7] By visualizing a process, one can identify opportunities to optimize it with automation or create a better process designed for automation from the beginning.

Process maps can also be implemented as interactive artifacts that link processes to supporting materials.[8] For example, a process map for MDMP can show workflow steps and link each step to references (e.g., Field Manual 5-0, *Planning and Orders Production*), related processes (e.g., troop leading procedures), and other materials (e.g., regulations). When a process, subprocess, or task is changed, the doctrine team updates the appropriate process map(s), and this guides updates to systems that must change to support the revised enterprise-level process.[9] Finally, an electronic document management system provides an audit trail. The ideal representation of a decision captures more than the end result, it captures processes and resources for how the decision was made.[10] Audit trails are common in electronic document management and allow users to know how decisions were made, when they were made, and by whom they were made. Imagine the benefit of understanding the history of prior decisions. For example, the audit trail can be used to understand how MDMP was performed when preparing for an after action review. For a maneuver action, the audit trail can be used to evaluate an end-to-end orders process—from the initial MDMP to the subsequent process for related fragmentary orders—to understand how and what decisions were made during an initial engagement and inform decisions about reengaging the enemy force.

Examples of Command Post Automation

The author's concept of command post automation that brings the ideas in this article to life is an Electronic



(Figure by author)

Figure 2. Risk Assessment Workflow Example

Tactical Document Management System (eTDMS), depicted in figure 1 (on page 82). The system is integrated with traditional battle command systems (i.e., intelligence, logistics) so data is shared between systems. And MDMP is the process used in this article to explain how command post automation works.

An eTDMS improves efficiency by providing enterprise-level document storage, automating standard repeatable processes, and managing workflows. The result is faster execution of processes with better quality while limiting errors. Examples of opportunities to improve efficiency with automation in an eTDMS include

- standardized libraries that promote consistency throughout the planning process,
- the ability to reuse prior content for standard paragraphs or terrain analysis, and
- autoclassification of documents (e.g., situation reports, contact reports) with the capability to autogenerate visualizations from the data in them or to incorporate machine learning models into an analysis.

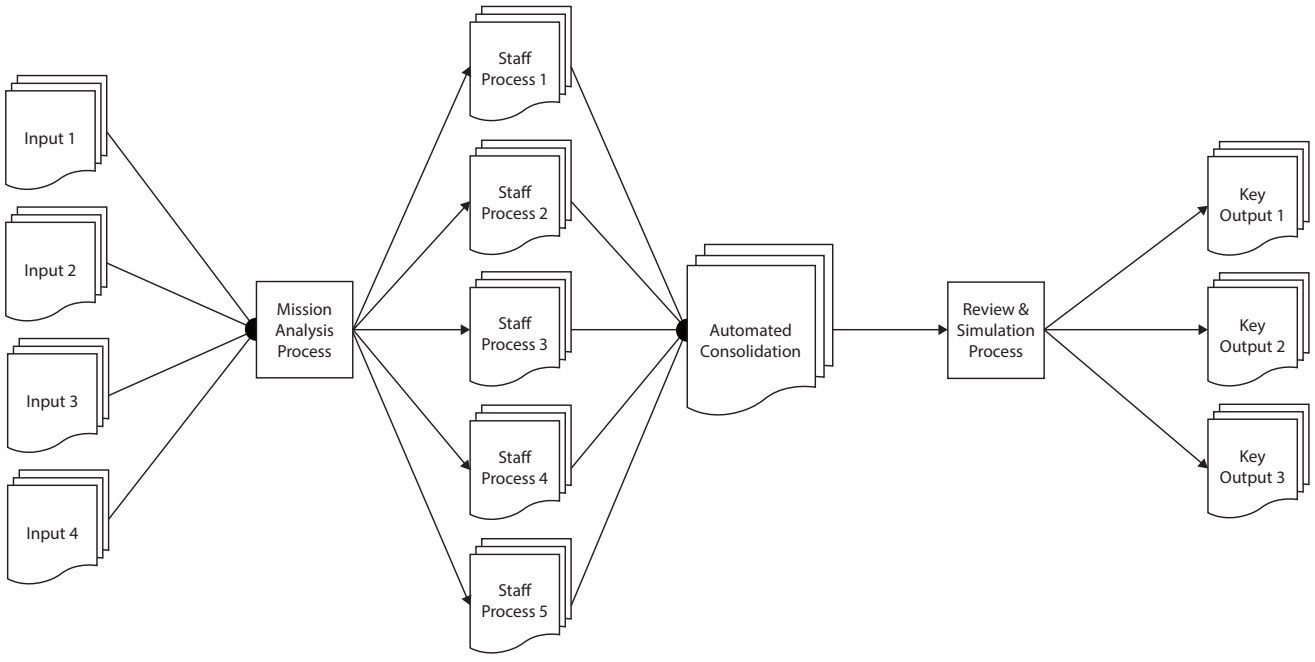
Automating risk assessment scenario. In this scenario, the eTDMS manages libraries of historical risks, errors, and mitigations by tactical task. The system allows users to distinguish between training and combat operations so that the correct context is analyzed. For example, parachute jumps during training are typically conducted with more safety procedures than combat parachute jumps. Training jumps also have a simulated enemy threat.

During combat jumps, drop altitude, number of passes over the drop zone, and securing reserve parachutes are examples of choices leaders have to make. This type of analysis can be automated. Risk scores can be assigned based upon the enemy situation as well as safety procedures. Machine learning models created by the brigade tactical data science team are used to model the real-time enemy situation. Furthermore, the tactical data science team enhances their ground combat models with Air Force data so that enemy air defenses are part of the risk assessment.

An eTDMS increases effectiveness by improving planning quality and reducing errors during content creation. Controls are also applied to prevent errors in orders production and distribution. For example, the system has controls so that the wrong document type is not created for the wrong purpose (e.g., an administrative order when an operations order is appropriate). The eTDMS automates paragraph classification based upon the classification of data at the information source.

To ensure that documentation is complete, the system generates a list of required and optional documents for a specific task or subprocess within the MDMP. This list is integrated with milestones for the overall process so that users know when they must be complete with their tasks or subprocesses. The list can also be tailored for standard and modified processes. For example, in a compressed MDMP cycle, many of the required documents for the standard MDMP might be shown as optional or not required for the compressed process.

Templates are also linked to tasks and subprocesses (see figure 2). This ensures that the correct templates are used for a task or subprocess. Standardizing documentation with templates improves metadata (which can be autogenerated based upon the template and content once completed). It also improves the ability to extract data from documents and to perform advanced analysis with machine learning.



(Figure by author)

Figure 3. Mission Analysis Workflow Example

As part of an eTDMS milestones are autogenerated based upon the time available for planning (i.e., automated implementation of the one-third–two-thirds rule). Automation of workflows includes tracking completion of milestones with reminders, alerts, reports, and visualizations. Examples of opportunities to improve effectiveness with automation in an eTDMS include the following:

- *Email ingestion of documents into the correct file structure for planning.* This ensures the right documents are available throughout the planning process.
- *Consistent use of doctrine for metadata and terms.* For example, an eTDMS can use doctrine such as Field Manual 1-02.2, *Military Symbols*, to define metadata, tactical terms, and symbology.
- *Intelligent planning.* Data from tactical systems (e.g., geographic information systems, Distributed Common Ground System-Army) can be integrated with staff planning workflows in the eTDMS. For example, when a user selects an area on a digital map, terrain and enemy situation descriptions are automatically generated and inserted into the correct parts of a template with the correct classification.
- *Automated dissemination based upon task organization.* When an operations order is published, the command relationships identified in the order can be used to create the distribution list. The order is then automatically disseminated. When controls based upon classification are required, the relevant sections (e.g., any paragraphs classified as secret) are automatically redacted.
- *Simulations.* The system forecasts tactical milestones for an operation. Simulations use up-to-date geographic information system and GPS data as well as real-time updates to the enemy situation.

Automating step 2 of MDMP (mission analysis) scenario. In this scenario, the eTDMS manages the inputs to mission analysis and implements the correct workflow when the inputs are processed (see figure 3). The inputs are the commander's initial guidance, higher headquarters order, higher headquarters intelligence and assessment products, knowledge products from other organizations, and any design products.[11]

The commander uses an eTDMS template to craft initial guidance. Once the guidance document is complete in the eTDMS, it is automatically incorporated into the workflows for the rest of the planning process. (When documents are updated, version control is applied and the updates with notifications are submitted to the workflow.) The higher headquarters emails

Soldiers with the 2nd Battalion, 4th Security Force Assistance Brigade, work in their tactical operations center 3 June 2020 before deploying to the Joint Readiness Training Center and Fort Polk's training area for Rotation 20-08. Note the use of manual processes (e.g., paper maps, paper charts). (Photo by Chuck Cannon)

its products to the brigade. They are automatically ingested into the eTDMS. After ingestion, they are automatically categorized and elements extracted for use in selected workflows (e.g., specified tasks).

The complete set of higher headquarters documents are available in the eTDMS document library. Knowledge products from other organizations and design products are not standardized. Nonetheless, they can be emailed and automatically ingested into a folder for nonspecific documents and manually evaluated. As part of this manual evaluation, they are added to the appropriate workflows.

Throughout mission analysis, milestones are updated (e.g., receipt of order and movement time for the first unit). Unit symbology is automated based upon the task organization. To conclude mission analysis, the various products go through an automated process of consolidation to create the key outputs. The executive officer manages the consolidation process and also decides when simulations are performed. Once the key outputs are reviewed, revised, and approved using workflows for each output they are automated as inputs to step 3 (course of action development).

Conclusion

Automation has several advantages, and it is not a new phenomenon. Today's technology offers numerous opportunities for automation in command posts. What is extraordinary is that so many processes in today's command posts remain manual. They are slow and missing modern quality control measures. Yet the Army continues to promote advanced concepts for information such as AI without improving the baseline processes that are necessary to make the advanced concepts work.

This article has highlighted concepts for command post automation. In closing, there are areas that are beyond the scope of this article but should be brought the attention of the reader. First, there are other opportunities for automation in command posts; this article has

focused on only one, which is document management. Second, automation does not mean a lack of human intervention. For example, humans are part of quality control processes, and some tasks will remain manual because they are not easily configured in the system, the system does not have the right functionality, or humans are simply better at them.

Third, the Army has used digital technologies to perform command and control activities such as disseminating documents for decades. Even though this article does not address the networking and cloud infrastructure to support command post automation, it is inconceivable that a twenty-first-century Army cannot take advantage of or enhance the digital infrastructure that exists today. The operational environment, to include large-scale combat operations, should not be a barrier to command post automation.

Fourth, an eTDMS will be able to support processes between echelons. For example, MDMP occurs at battalion level and above while companies and below perform troop leading procedures. But both processes result in combat orders and the data between the processes overlaps. An eTDMS enables each individual process and shares data between them.

Fifth, an enterprise level system will generate enough standardized data to support machine learning at scale. With such a system, leaders will be able to generate insights from Army-wide data for the appropriate echelon and process. This will truly lead to an ability to act and assess faster than any enemy we might face today. ■

The author thanks Col. Christopher Coglianese, U.S. Army, retired, and Lt. Col. James King, U.S. Army, for reviewing an earlier version of this manuscript.

Notes

Epigraph. Shaun Waterman, "Achieving Decision Dominance by Empowering the Tactical Edge: Sponsored Content," *Signal* (website), 1 August 2021, accessed 6 April 2022, https://www.afcea.org/content/achieving-decision-dominance-empowering-tactical-edge-sponsored-content.

1. Kathy Pretz, "Stop Calling Everything AI, Machine-Learning Pioneer Says," *IEEE Spectrum* (website), 31 March 2021, accessed 6 April 2022, https://spectrum.ieee.org/stop-calling-everything-ai-machinelearning-pioneer-says.

2. Harry D. Tunnell, "Network-Centric Warfare and the Data Information-Knowledge-Wisdom Hierarchy," *Military Review* 92, no. 3 (2014): 43–50, accessed 6 April 2022, https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20140630_art011.pdf.

3. Harry D. Tunnell, "Tactical Data Science," *Military Review* 100, no. 4 (July-August 2020): 123–37, accessed 6 April 2022, https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/July-August-2020/Tunnell-Tactical-Data-Science/.

4. Ralph Sprague Jr., "Electronic Document Management: Challenges and Opportunities for Information Systems Managers," *MIS Quarterly* 19, no. 1 (March 1995): 29–49, accessed 6 April 2022, https://www.jstor.org/stable/249710?seq=1.

5. Jeff Abbott, "Task Based Approach to Planning White Paper," *SCSC '08: Proceedings of the 2008 Summer Computer Simulation Conference* (June 2008): 1–7, accessed 6 April 2022, https://dl.acm.org/doi/pdf/10.5555/2367656.2367684.

6. Monika Malinova, Henrik Leopold, and Jan Mendling, "An Explorative Study for Process Map Design," *Information Systems Engineering in Complex Environments* 204 (2015): 36–51, https://doi.org/10.1007/978-3-319-19270-3_3.

7. Odunayo Fadahunsi and Mithileysh Sathiyanarayanan, "Visualizing and Analyzing Dynamic Business Process Using Petri Nets," *2016 2nd International Conference on Contemporary Computing and Informatics* (2016): 79–84, https://doi.org/10.1109/IC3I.2016.7917938.

8. For an example of the concept, see "Documenting Policies," BlueWorksLive, accessed 5 July 2022, https://www.blueworkslive.com/scr/docs/bwl/topics/policies.html.

9. Ibid.

10. Cheryl Putnam, Jeff Waters, and Olinda Rodas, "A Standard Decision Format Using Provenance," *2017 IEEE International Symposium on Signal Processing and Information Technology (ISSPIT)* (December 2017): 216–19, accessed 6 April 2022, https://ieeexplore.ieee.org/document/8388644.

11. Field Manual 5-0, *Planning and Orders Production* (Washington, DC: U.S. Government Publishing Office, 2022), accessed 29 June 2022, https://armypubs.army.mil/ProductMaps/PubForm/Details.aspx?PUB_ID=1024908.

CALL FOR PAPERS

STRATEGIC LANDPOWER SYMPOSIUM

9 – 11 MAY 2023

ARMY HERITAGE AND EDUCATION CENTER, CARLISLE, PA

The **USAWC**, in partnership with **HQDA G-3/5/7** and **Army Futures Command**, requests research papers on the **"role of strategic Landpower in future Joint and Combined operations."** We welcome proposals from scholars, students, defense professionals, and others from the national security community on the following themes or related topics:

1. Campaigning, Integrated Deterrence, Competition, Cooperation, and Setting the Theater
2. Defending the Homeland, Defense Support of Civil Authorities, Disaster Relief, the Arctic, Climate Change, Threats to the Homeland, Mobilization, and AC/RC Mix
3. Leadership, Talent Management, Modernization, Readiness, the SECARMY's Six Objectives
4. Future Challenges, Strategic Gaps, Technology, Large Scale Combat Operations, Urban Operations, Multi-National Operations, and Integrating Joint Domains

Abstract Submission Guidelines: Interested participants should submit an abstract of no more than 500 words and a CV. Abstract and CVs are due **1 October 2022**. Include the thesis, methodology/sources, and how this piece advances the Landpower discussion. Submit abstracts and CVs to the Symposium website below.

Paper Guidelines: Papers should be 4,500 to 5,500 words, following the *Chicago Manual of Style*. **Papers are due 15 January 2023**. The best papers will be selected for presentation at the Symposium in May and considered for publication. Prizes may be awarded for the best papers. Submit papers using the Symposium website below.

Please note: Submitted papers cannot have been previously published, under review with another outlet, nor be forthcoming in any print or electronic publication.

You can find more information about the Symposium and author's guidelines at the Symposium website: https://csl.armywarcollege.edu/landpower/

Contacts:

Dr. Gregory Cantwell, gregory.l.cantwell.civ@army.mil or 717-245-3235
MAJ Justin Magula, justin.m.magula.mil@army.mil or 717-245-4814

THE UNITED STATES ARMY WAR COLLEGE