Artificial Intelligence in the Marine Corps Logistics Enterprise

Part 3: It's not pretty: How can we start making AI progress 'prettier'?

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Introduction

In our first article, we discussed the definitions of artificial intelligence (AI), business analytics, data, and other similar terms to level set understanding. In our second article, we described how "ugly" the precursors of AI are within the Marine Corps logistics enterprise and alluded to fixes that must occur for successful AI implementation.

We began this research as an effort to describe how to implement AI in logistics applications. However, through our research, we uncovered an inconvenient truth that the current personnel involved in logistics do not possess the multitude of technical skills required to manage, enable, or implement AI systems.

In this article, we present to you a business case that outlines a fundamental shift in how we view our logistics operators in a data-driven world. AI applications require constant and realtime development, maintenance, and updates. AI applications are also specifically targeted at well-defined decision points. We cannot ask contractors to build thousands of different AI applications to manage deck plate issues. Global Combat Support System is our current enterprise resource planning database, and it has a lot of information that may or may not be useful, depending on the decision point at hand. However, what is more important is reliance on an individual's ability to carve out the right data from the system, create

the right inferences, then present the information to the decision maker. Business analytics, the use of technology and software tools, the creation of decision trees grounded in data, and a

> *AI applications require constant and realtime development, maintenance, and updates.*

basic business understanding of what needs to be done must be built by our own logistics personnel. In business, executives are continually faced with a question: do they make a capability within the organization, or do they buy it by outsourcing the capability? We argue that professional skills need to be developed within Marine Corps logistics personnel instead of trying to purchase systems or contracts to develop AI applications.

Purpose

The purpose of this article is to formalize our ideas about the training, education, and recruitment of logistics professionals that will enable AI development and improve our broader logistics community in a rapidly advancing technology- and data-driven world.

Objectives

To achieve this purpose, this article will highlight the need for designing a sound business strategy, propose solutions that should be included in the strategy, and ensure implementation is tracked through a strategy map. Strategic implementation will ensure changes are well-founded, made based on the strategy, and not lost as leaders make permanent change of station moves and shuffle between billets. And finally, the Marine Corps can incrementally build a logistics force that is astute in the data domain.

The strategy must tackle key shortfalls:

Vision: Marine Corps logistics is at a critical decision point: take a risk to rapidly move toward the shiny object
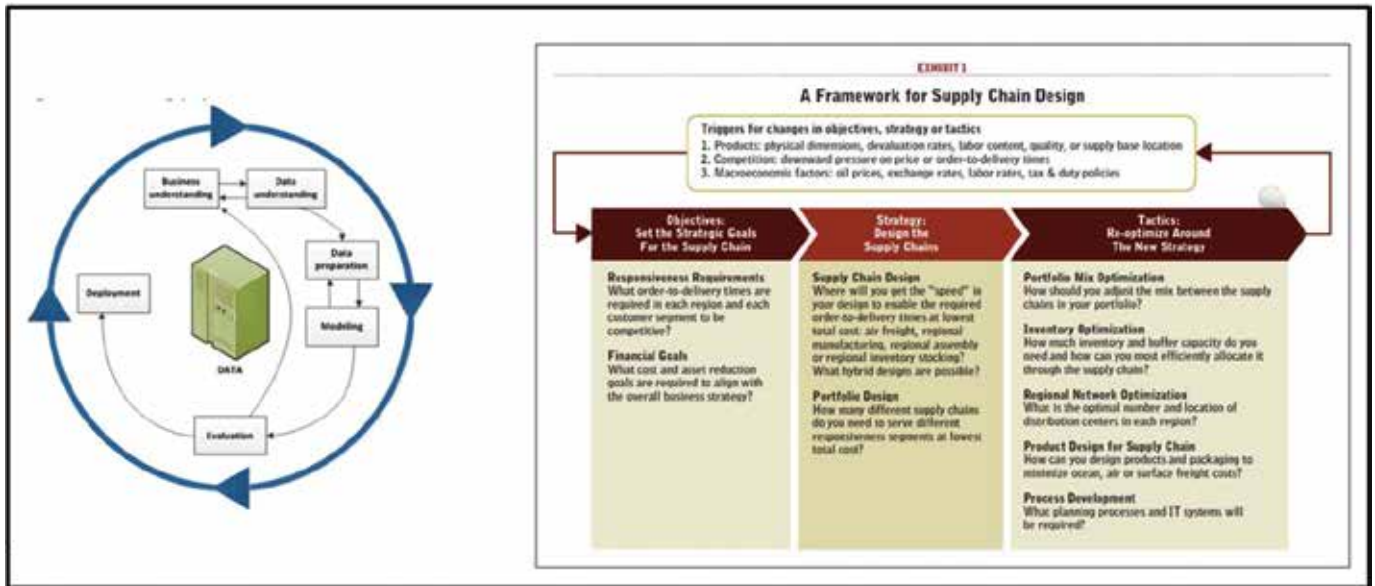
Figure 1. (Figure provided by authors.)

of AI without the appropriate strategic building blocks and talent, or take the prudent risk to patiently wait and build from within. A long-term strategic vision is necessary here.

Labor: Ideas like postponement and supply chain design/strategies are rooted in business analytics. So, who is responsible for business analytics? Who is trained and capable? Who has refined abilities to perform proper business analytics?

Talent: Make the capability, do not buy it. If the Marine Corps logistics enterprise decides to buy commercial solutions (consultants, contractors, or systems), they are not going to have the Marine Corps' business understanding. Likewise, having underprepared Marines tackle the problem is like asking a right-handed person to write with their left hand. Therefore, specific talent, expertise, and aptitudes need to be brought in at the entry-level and woven into the fabric of logistics professionals.

To maintain a productive focus on AI implementation for logistics decision making throughout the organization, established frameworks for data mining and strategic implementation should be used. Above is an example of how IBM's Cross-Industry Standard Process for Data Mining would support a strategic framework aimed at

optimizing the supply chain (Figure 1). Notice that business understanding, data understanding, data preparation, and modeling are parts of the core structure of the chain. Data handling is the bedrock of their network design. Indeed, these core elements are the anchor points in any logistics operation—Marine Corps logistics included—no matter the desired end state. This combination of the Cross-Industry Standard Process for Data Mining and the "Framework for Supply Chain Design" is one of a thousand models of business processes and tools used in almost all industry efforts.

Solution: Enterprise-Level Conceptual, Strategic Actions

To unpack the statement below, we need to have a common understanding of business strategy, permanent structure change, operational effectiveness, and types of innovation. We will discuss each of these components; but first, here is the statement:

> As the assessment in preceding articles indicates, the Marine Corps does not have a sound business strategy to keep up with advancements surrounding AI. We are stuck in stage one operational effectiveness, trying to implement AI as disruptive innovation. We do not understand that we are at the precipice of permanent change to

the logistics structure regarding data usage and visualization. Data is critical because the future of supply and logistics is rooted in data. People at all levels in the organization will have to understand data, how to collect it, manage it, manipulate it, and translate it into relevant and timely decisions. The ability to do so rests in technical skills, knowledge, and access to relevant systems.

Business Strategy

Business strategy is a well-defined, overarching, and long-term plan to achieve a certain goal. Strategies include well-understood plans, timelines, goals, and assessments to be successful. The Marine Corps' logistics challenges match what current business executives are seeing in various industries (Figure 2 on following page)—a shortfall in technical skills to perform business analytics. Businesses are aggressively identifying these gaps and deliberately developing business strategies to address the shortfall; it is a matter of survival because they are realizing that without these competitive advantages, they will not succeed against competitors who are able to make better decisions faster and more efficiently. The following statement is a synopsis of survey results from 60 senior-level supply chain executives:

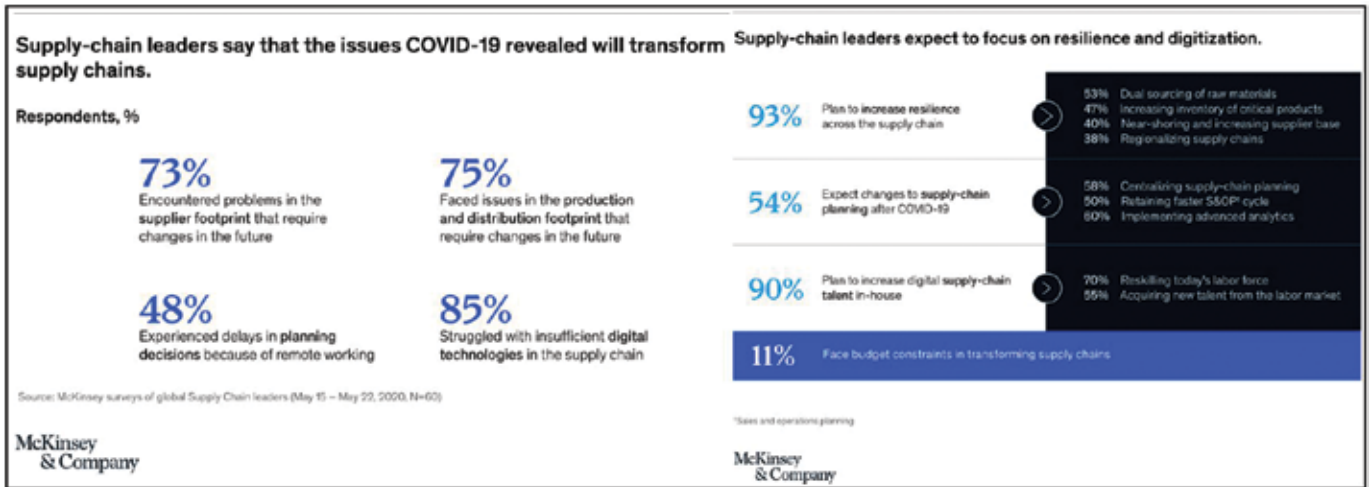> They see an urgent need to get better control over their supply-chain technology, which will likely be possible

Figure 2. *(Figure provided by authors.)*

only with a skilled workforce trained to use new digital tools at speed and scale. *Some 90 percent of leaders surveyed say* they *plan to increase the amount of digital supply-chain talent within their organizations*, through a combination of *in-house reskilling* and external hires. Just over half also expect permanent changes to their planning processes as the next normal, such as greater centralization of planning activities, shorter planning cycles, and *introducing advanced-analytics techniques.*[1]

Therefore, if 90 percent of companies are planning to increase digital-supply-chain talent in-house and introduce advanced analytics (Figure 2), the Marine Corps should keep pace with these strategies.

Permanent Structure Change

Before such adaptations can be made, operational effectiveness must be internally supportive versus internally neutral. In his article, "Triple A Supply Chain," Hau L. Lee describes how successful businesses tackle permanent structural changes in their organizations. He says they foster agility, adaptability, and alignment to keep pace with permanent structural changes in industry. AI is undoubtedly a permanent structural change in the way Marine Corps logistics operations will be executed and managed.[2] Case study reviews show us that time and again, organizations that do not appropriately manage change cannot keep up

with rapid and critical advances. For Marine Corps logistics, the currency is time and accuracy—sometimes the most important factor is a fast decision, and sometimes the most important factor is an accurate decision. The Marine Corps will struggle to make competitive, timely, and accurate decisions if it does not properly manage the transitional changes that lead to AI.

Lee also addresses the most common pitfalls and mistakes. He describes that supply chains often become uncompetitive because they do not adapt to changes in the structures of markets or

remain aligned with the strategic objectives of the organization. Adapting to technology and data and remaining aligned with the commandant's talent management strategies is needed. According to Lee, "companies may find it tough to accept the idea that they must keep changing, but they really

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Companies must adapt to the permanent change in technology and data advancements, and the Marine Corps must do the same.

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have no choice" and "most companies don't realize they face near-permanent structural changes/shifts in the market like advances in technology."[3] Companies must adapt to the permanent change in technology and data advancements, and the Marine Corps must do

[...] Perceptual Measures for Operations Effectiveness	
Stage	**Measures**
1. Internally neutral	The objective is to minimize operations negative potential.
	Firefighting is common.
	Outside experts are called in for strategic decisions.
	Operations are primarily reactive.
2. Externally neutral	Industry practice is followed.
	The aim is to achieve competitive parity.
3. Internally supportive	Operations investments support the business strategy.
	An operations strategy is formulated and pursued.
4. Externally supportive	Operations is involved upfront in major strategic decisions
	The aim is to achieve a competitive advantage through operations.
	The goal is to achieve competitive superiority.

Figure 3. *(Figure provided by authors.)*

the same. At first, failure to make these appropriate adaptations will make it difficult to make the most basic logistics decisions; subsequently, it will be difficult for the Marine Corps to interface with other Services, industry logistics organizations, and open-source systems. Ultimately, it will hinder the Marine Corps from making rapid and accurate sustainment decisions to support units fighting an adversary.

Operational Effectiveness

There are four stages of operational effectiveness commonly understood in business education and execution (Figure 3 on previous page). In the book, *Operations and Supply Chain Management for MBAs*, organizations are expected to progress through these stages to meet strategic objectives. This framework guides organizations to actions that move them to being healthy, sustainable businesses.

Marine logistics sit firmly in stage one—having poorly focused objectives, firefighting, outsourcing to experts, and being reactive. At a minimum, the Marine Corps needs to elevate its logistics operational effectiveness from stage one to stage two. The aim of achieving competitive parity with standard-setting logistics organizations like Walmart, FedEx, and West Marine is to help focus efforts and establish limits. By understanding and following industry standards, it is possible to have a benchmark for comparison. The thing the Marine Corps has in common with leading organizations is that everyone uses enterprise resource planning systems, and Oracle databases (like Global Combat Support System) are high-caliber systems. However, unlike leading companies, the Marine Corps does not hire skills and talent to utilize these resources. In fact, moving from stage one to stage three would probably be the most ideal. Our business model in the Marine Corps is unique and requires specific tailoring. Therefore, specifically formulated strategies supported by operations investments are required, in other words, alignment. Advancing to stage four is unnecessary. Stage four implies that the organization

is leading development and innovation. We do not need to be ahead of commercial industry in this effort; we do not have the research and development resources. We need to be at stage four for Marine Corps warfighting, not for logistics applications.

Types of Innovation

Innovation is not truly understood without understanding where effective innovation is best implemented. In the article "How Many Supply Chain Innovations Are Truly Revolutionary?" the author discusses two kinds of innovation: sustaining and disruptive.[4] Disruptive innovations are drastic. They change the whole idea about something—its process and design. It gets everyone excited. Sustaining innovations move organizations forward at a steadier pace with innovations and ideas that are more grounded and incremental. Executives view disruptive innovation as the shiny object in the room and as the most glamorous object to pursue. The author warns that executives tend to gravitate toward the disruptive when they should be more focused on the less exciting sustaining innovations. The author goes on to say that "incremental change represents one of the most powerful weapons companies have to stay ahead of the competition."[5]

> **Is AI a sustaining innovation or is it a disruptive innovation?**

Wrap-Up for Strategic Enterprise-Level Solution

Is AI a sustaining innovation or is it a disruptive innovation? It should be treated as a sustaining innovation. However, it is currently and incorrectly viewed by leadership as a disruptive innovation. We must not misjudge where to align our innovation. The way companies are moving toward AI is radically different than our current logistics design. Our design should be matured through a strategic and incremental approach. We are not rejecting

AI. In contrast, we agree that it is likely the way of the future, but conceptual shifts in thinking are needed to move to stage two of operational effectiveness. Therefore, our idea is to ratchet down the glam of AI and focus on sustainable measures to improve the AI building blocks or precursors discussed in our first article: data, information, knowledge, automation, and deep/machine learning. Shifting our focus on AI from a disruptive innovation to a sustaining innovation will enhance and grow our response to the permanent changes we are seeing in data and technology. There are very important things needed to strengthen our logistics capability to remain agile, adaptable, and aligned to the permanent structural changes of data and technology. Investing in people, training, and education will likely enable AI in the future as well as make us better in many other areas of logistics operations.

Solution: Immediate, Targeted Actions

We have identified achievable actions that can be developed now to prepare the logistics landscape for permanent advancements in technology and data proliferation. We outline specific logistics fault lines that must be improved to better position the logistics enterprise to compete in the data and technology domain.

Dr. Langley, a professor who teaches Supply Chain Innovation and Transformation at Penn State's Smeal College of Business gave his answer to the question, "What are the precursors that have the best chance of success at implementing AI for logistics and supply chain management?" as follows:

> Facilitating the uses of AI can be accomplished with the help of capable people who have the math and statistics qualifications to understand and implement relatively concisely defined applications of AI. This would need to include having capable talent in the relevant areas of math and statistics, in coordination with those having operational and strategic involvement in logistics and supply chain. Then, this could be a steppingstone to conceptualizing and launching a larger and

more organizational-encompassing plan that would involve AI.[6]

Dr. Langley's analysis is well aligned with the key observations we have made in our research and based on our experiences in the operating forces. Namely, we are lacking technical talent in entry-level (supervisory management) positions. Furthermore, the skills need to be developed and cultivated through clear talent management practices; AI is not a commercial off-the-shelf system that can be purchased.

Professional Education Opportunities (Enlisted and Officer)

Professional education opportunities are already in place to some extent in other areas, but they have not been fully executed within business analytics, for logistics. Again, the future of logistics is rooted in data, and we must firmly plant Marine talent in appropriate jobs to fully optimize the benefit of data collection. The goal is to start building a base from within our ranks that can maneuver through rapidly advancing technology and exponential information flows. A start is to direct and fund ten enlisted and ten officers to complete a certificate in business analytics from Smeal Business College, Penn State University, and then grow this number over time; make it mandatory for logistics and supply chain officers to get analytics certifications from reputable sources before attaining the rank of captain; and send Marines to formal Oracle training programs and place certified Marines within Marine Logistics Groups, Logistics Command, and Logistics Division, Installations and Logistics to function as operational, business, and data analysts.

Establish Lower-Tier Corporate Business Fellowships with Large Logistics Enterprises

Through the Marine Corps top- and intermediate-level schools, we send individuals to think tanks, academic institutions, interagency programs, as well as a few corporate businesses every year. These programs target more senior Marine officers to develop conceptual-level understanding. They do not target developing technical skills or the how-to

of business operations. No one seems to be learning best practices for distribution, warehousing, procurement, or network design for holistic logistical or supply-chain operations. These opportunities and skills should be offered and taught to the lower tiers (e.g., first lieutenant, captains, sergeants, and gunnery sergeants). It would be beneficial to send logistics specialists to supply-chain industry leaders like Walmart, Home Depot, Scotts Miracle Grow, Amazon, and many others, giving them a clear directive to understand the companies' business models, the systems, software, and technology they use, the analytics they espouse, and how all these elements translate into executive decision making.

Adjust Logistics and Supply-Related MOS Pipelines

The Marine Corps should recruit college graduates with degrees in supply chain management, statistics, data science, analytics, and other similar areas to be contracted as logistics or supply officers instead of assigning an MOS at The Basic School. To do so means to hunt for the talent we need to survive in this data environment and slowly begin to embed it within the foundation of Marine Corps logistics. Industry would never hire an art studies student to work logistics operations and data management, but the Marine Corps does. Instead, industry would recruit the specific talent that they need, and the Marine Corps should begin this process incrementally. Not all logistics and supply officers need to fit this model, but five to ten percent could be an achievable initial goal. To take it a step further, the Marine Corps should look to establish a new MOS for maintenance management officers

(e.g., school trained in business analytics, data visualization, etc.).

Funded Internships for Professional Graduate Students from Relevant Degree Programs

Businesses are doing this on a large scale. Companies like Dell, Johnson & Johnson, Shell, and FedEx, to name a few, team up with universities and provide paid internships for business school students during the summer prior to their graduation. The Marine Corps could take the first step by coordinating with Smeal College of Business at Penn State University. This would strengthen the already strong Marine Corps fellowship program at Penn State. A productive start would be providing one to three positions at the MLG and Headquarters Marine Corps Installations and Logistics levels.

Strategy maps provide organizations with better visualization of strategic business processes and provide an understanding of strategy interactions. Our proposed solutions are aligned with the strategy map Figure 4 (on following page). It is essential to note that as the Marine Corps onboards talent and skills for this effort in the form of

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internships and recruiting efforts, those individuals need to be clearly aware that they are walking into newly defined roles. They cannot have the misperception they are walking on well-trodden paths. They will be the individuals expected to mature the effort and make progress.

Failure is a certainty if we remain on the current path. Right now, Marines are seeking education opportunities independently by completing degree and certification requirements on their own while often personally funding their programs. Marines that have an interest
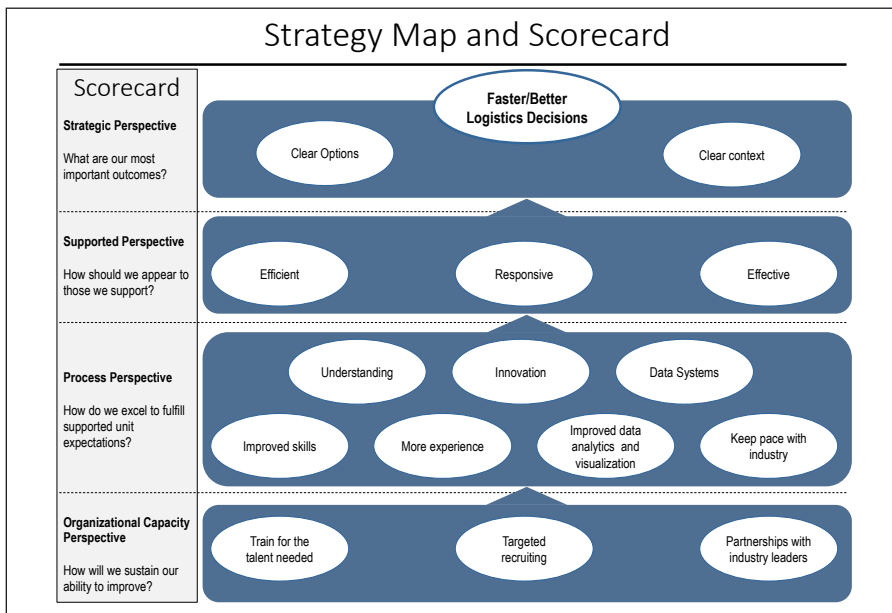
Figure 4. *(Figure provided by authors.)*

in this area are watching YouTube videos and getting self-help books to read on the weekends and after hours. This is the type of great personal initiative that we love to see in the Marine Corps, but it is not a strategic business model to follow at the enterprise logistics level.

High-Level Timeline

Billet turnovers, shifting priorities, and lack of focus will be hindrances to implementing these changes. The timescale for changes to take effect will be slow. The people and organizations that implement the changes will not be the same people and organization to assess the effectiveness and make adjustments. Therefore, understanding the timescale is critical to achieving success. Just as the Commandant's *Force Design* is not a one-year project but a ten-year plan to slowly move the Marine Corps toward his vision, so also our concept to infuse targeted logistical talent within our ranks to harden Marine Corps logistics conveys long-term vision. To survive changing technologies and remain flexible and inclusive of the nature of AI and analytics involves incremental steps to populate the force with the talent needed. At a minimum, this is a five-year process to infuse the force with critical technical skills, and talented logistics and supply-chain managers. The results of this type of

effort will be seen over longer periods of time, and in this case, more training, and over longer periods of time, is better. For example, sending more Marines to get formal skills will result in faster progress toward AI management.

Conclusion

Essentially, the goal is to use AI to make better and faster decisions. A lot of time is wasted trying to put information into context, but by understanding infographics, statistics, and probabilities, an individual can quickly put information into focus for quicker and better decisions. Humans conducting analytics are the foundation to stay in step with changing information and technology environments. To keep pace with future innovative advancements like AI, employing the correct people is a top priority, then the systems—not the other way around. For example, only trained drivers drive Formula One race cars. If a random person is asked to drive the car, he would not even know how to get in, much less buckle in and start the vehicle—and then drive it? He would be lost. The environment is foreign, and the levers, buttons, and diagnostics would be meaningless. Business analytics tools and AI are high-performance vehicles. Without the proper talent and training, a person is looking at blank screens and mounds of data

that mean nothing. Great information is embedded within the tools Marines use. Having talented Marines with the background and training in advanced analytics is critical to "driving" the AI innovations of the future. Having the types of people that will drive AI innovation involves taking what we have—plenty of Marines that possess a deep understanding of Marine Corps logistics and supply—and giving them the skills and education required to push business analytics into AI applications.

Elon Musk wants to go to Mars, but he is not going there tomorrow. He and many others in his organizations have been working for over a decade with many precursors and contributing factors to inch closer to the goal. The DOD, the Joint Staff, and the Marine Corps all want some level of AI. This is a great vision and something we should move toward, but it will not happen overnight. There are precursors and contributions that must be made to get us there smartly.

These articles represent our contribution to the vision of implementing AI in Marine Corps logistics. We hope others will build on the concepts we have mentioned and take it to the next phase of development.

Notes

1. Knut Alicke, Richa Gupta, and Vera Trautwein, "Resetting Supply Chains for the Next Normal," *McKinsey,* July 21, 2020, https://www.mckinsey.com/business-functions/operations/our-insights/resetting-supply-chains-for-the-next-normal.

2. Hau Lee, "The Triple-A Supply Chain," *Harvard Business Review*, October 2004, https://hbr.org/2004/10/the-triple-a-supply-chain.

3. Ibid.

4. Jim Rice, "How Many Supply Chain Innovations Are Truly Revolutionary?" *Supply Chain 24/7*, January 2019, https://www.supplychain247.com/article/how_many_supply_chain_innovations_are_truly_revolutionary.

5. Ibid.

6. Email correspondence between authors and Dr. Langley in June 2022.