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GETTING REAL ABOUT BLOCKCHAIN IN AEROSPACE AND DEFENSE

By Matt Aaronson, Henry Caffrey, Steven Won, and Jeff Ahlquist

IT'S EASY TO GET caught up in the buzz about blockchain. Aerospace and defense (A&D) evangelists claim the technology will revolutionize the tremendously complex supply chains of original equipment manufacturers (OEMs) and their suppliers by transforming processes as diverse as contracting and certification. Yet when we speak with industry executives, most have been slow to adopt the technology, in part because of one stubborn issue: it's difficult to see how blockchain will create value.

In a recent BCG survey of supply chain executives across the A&D industry, conducted jointly with the Aerospace Industries Association, only 20% of respondents said that their firms are assessing blockchain in a meaningful way, half were unsure what their companies were doing about blockchain, and the remaining 30% said that their companies were not pursuing the technology at all. The reality seems far from the much-hyped "revolution" that is supposedly coming.

Blockchain has significant potential, but A&D executives are justified in being skept-

tical. Our research shows that of the three value drivers for blockchain applications in A&D companies, most of the industry buzz focuses on the two with the least potential. The industry needs to stay abreast of blockchain developments given how rapidly this technology is evolving, but blockchain will not transform A&D supply chains just yet.

Blockchain Basics

Blockchain was ushered into widespread use by bitcoin, the global digital currency. The technology generates an immutable record of a transaction that is distributed across a network (rather than stored in a central database). It creates a level of radical transparency, enabling all members of the network to see and agree on one shared truth about the history of a digital asset. (See the sidebar "What Is Blockchain?") Blockchain has obvious value for some applications, such as digital payments. Because it prevents duplication and falsification, a digital record can serve as a store of monetary value in the same way that hard currency does in the physical world.

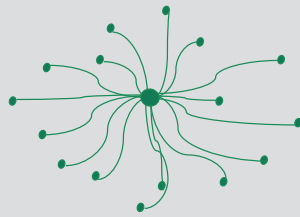
WHAT IS BLOCKCHAIN?

Traditional databases are built around a central repository that serves as the single source of information. Such databases are used, for example, in digital payments networks, where a bank keeps the sole central record of accounts, or the ledger. As the owner of the repository, the bank is responsible for recording all changes to it. All nodes on the network are connected through the central repository and can't conduct transactions among themselves. Not allowing direct transactions between two nodes ensures that the system can be trusted—no one could pay a bill by sending an IOU, for example.

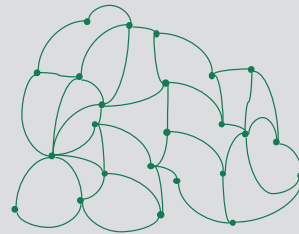
With blockchain, by contrast, there's no central record—rather, the ledger is distributed across a network. (See the exhibit.) A transaction that happens at one node becomes a permanent record in the ledger, which is automatically updated on *all* nodes. Among blockchain's benefits is security: falsified records can be quickly detected in a distributed ledger system. If the information on one node doesn't match the information on the others, that's a clear sign that something's wrong.

Blockchain Distributes Information Across a Network

TRADITIONAL DATABASE, WITH A CENTRAL REPOSITORY



BLOCKCHAIN, WITH A DISTRIBUTED LEDGER



Source: BCG analysis.

Supply chains in the A&D industry have several features that would seem to benefit from blockchain. (See Exhibit 1.) Specifically, the supply chains have many stakeholders that must share highly technical information about parts and materials. A&D companies also have intricate audit and certification requirements, complex contractual relationships, and a need for end-to-end visibility across the supply chain. These characteristics seem to be a match for blockchain's unique strengths. But how will implementing this technology lead to value? Can it make a company more profitable or grow faster?

How Blockchain Can Drive Value

Blockchain implementations can create value for A&D companies by unlocking

business efficiencies, disintermediating suppliers, and enabling new businesses and customer offerings. (See Exhibit 2.) The majority of the hype about blockchain is focused on the first two, but their potential for value creation is limited. The most exciting potential lies in the third value driver.

UNLOCKING BUSINESS EFFICIENCIES

One of the most-touted benefits of blockchain is that it can help companies more efficiently execute processes—such as those that track materials and parts as they move through the supply chain.

Consider, for example, that many processes at more than a dozen suppliers are required to transform raw material into a fin-

EXHIBIT 1 | Supply Chains' Features May Match Blockchain's Strengths



Shared assets and data



Many diverse stakeholders



Intricate audit and certification requirements



Complex contractual relationships



A need for end-to-end visibility



Value in linking interdependent transactions

Source: BCG analysis.

ished turbine blade, install it in an engine, and deliver it to an aircraft OEM and that each process has exacting specifications and criteria. Implementing a blockchain application would enable each supplier to create a record of what happens at each step of a process and make that record permanently accessible across the supply chain—to all previous and subsequent suppliers and the aircraft OEM. Moreover, if the blade experiences a quality problem, even years later, the OEM could potentially use blockchain to dramatically speed up remediation not only by tracing the blade back upstream but also by identifying other blades that may have a similar defect. Currently, most companies' knowledge of a blade is limited to the few suppliers that are directly before and after them in the

chain. Therefore, tracking, auditing, and investigating materials and parts is manual and tedious work.

In this example, implementing a blockchain application streamlines and simplifies the tracking process—but it's simply a more efficient way to perform an existing process. We characterize use cases that apply blockchain to replace existing, laborious, and largely manual solutions as being better, faster, and cheaper. The value-creation potential of these use cases can be significant and relatively easy to capture in some industries. But for A&D, the potential for value creation is limited to some fraction of the cost of executing the current solution, and capturing that value is likely to be challenging—as it ultimately requires

EXHIBIT 2 | Blockchain's Potential Value for A&D Companies

UNLOCK BUSINESS EFFICIENCIES

DISINTERMEDIATE SUPPLIERS

ENABLE NEW BUSINESSES AND CUSTOMER OFFERINGS

Potential value	Large contractors can replace existing, laborious, and largely manual processes with better, faster, and cheaper solutions	OEMs can work directly with early-stage suppliers, eliminating the need for midtier players that provide value-added services	Innovative companies can develop new products and services, creating new value
Supplier response	Continue to experiment and conduct pilots, but set realistic expectations	Understand sources of pressure and how to force change among midtier suppliers	Identify areas that are ripe for disruption and create new digital offerings

Source: BCG analysis.

Note: OEM = original equipment manufacturer.

eliminating some of the people who do that work today.

Overall, the A&D industry employs about 476,000 people in the US, according to the US Bureau of Labor Statistics, but only about 70,000 work on business processes such as logistics, procurement, finance, and compliance. Optimistically, if blockchain could reduce that number by 10%, that would result in a net reduction of 7,000 full-time employees (FTEs) across the industry and lead to a potential cost savings of just under \$500 million, a modest savings at best.

That may seem like a sizable amount of money, but it's not easy to capture that value. The median size of an A&D company in the US is only 32 employees. In a typical company of that size, only one or two people might be dedicated to business operations, and the tracking processes that blockchain could streamline represent only a portion of their job duties. For small and midsize companies, the total savings will likely represent less than one FTE—meaning the direct labor savings may be zero. Larger A&D companies could potentially find higher labor savings by using blockchain, but business efficiency use cases require participation across the supply chain to unlock the full value. Without the participation of small and midsize companies, the value will be limited even for large OEMs and suppliers.

DISINTERMEDIATING SUPPLIERS

The second potential value driver from blockchain in A&D supply chains is disintermediating suppliers, or cutting out suppliers in the middle of the value chain. The evangelists say that the transparency enabled by the technology could be particularly valuable to suppliers, especially those working with early-stage materials, as it could improve their understanding of how tier 1 contractors and OEMs use finished materials and parts. Understanding a part's service life, maintenance issues, and quality requirements could help these suppliers improve their materials and products, eliminating some of the value-added steps currently done by intermediaries.

Similarly, tier 1 contractors and OEMs could work more directly with early-stage suppliers. The businesses of midtier suppliers, however, would be threatened from both sides.

Disintermediation, then, doesn't create new value; rather, it *redistributes* value, taking profits away from suppliers in the middle of the chain and potentially pooling them at either end. Still, that represents a financial gain for early-stage suppliers (those at the beginning of the chain) and the largest tier 1 suppliers and OEMs (that are at the end). But our research indicates that midtier suppliers are acutely aware of this prospect, and it creates a disincentive for them to use blockchain. And because the value of blockchain use cases is dependent upon all parties in the supply chain participating, resistance from smaller or midtier suppliers presents a significant barrier to capturing value from disintermediation.

ENABLING NEW BUSINESSES AND CUSTOMER OFFERINGS

Although the first two value drivers have limited potential to create new value, this third one is promising. Because blockchain can securely distribute information across a network, companies can harness the technology to create products and services that previously weren't possible.

Outside the A&D industry, De Beers is a good example. The company has worked with BCG and BCG Digital Ventures on a blockchain-based solution to trace diamonds from the mine to finished pieces of jewelry. This new platform, called Tracr, was initiated by De Beers, is currently in the pilot stage, and will become a solution for the diamond industry.

A diamond tracked on Tracr carries a digital fingerprint with trustworthy information about its origins and qualities as well as critical transaction data, such as ownership transfers and processing. Tracr helps jewelers provide confidence to an end customer that a diamond is ethically sourced and processed. The platform also allows users to leverage its digital assets and build various kinds of new businesses on

top of it. Such businesses could include diamond-backed financing, compliance services, or market exchanges for consumers—services that were not possible without the ability to digitally track and verify each stone. (See “Does Your Supply Chain Need a Blockchain?” BCG article, March 2018.)

In the A&D industry, a manufacturer of complex parts is applying the same features of blockchain in a very different way. Currently, when a customer needs a replacement part, it can take weeks for this company to manufacture and ship the part. To expedite the process, the company is using blockchain to enable a worldwide network of 3D printers that can make its parts on demand, where and when they are needed. Using blockchain, the manufacturer can ensure that not only the correct version of a part is printed but also only the authorized number of copies, eliminating the risk of versioning errors or counterfeit parts.

The manufacturer could take this further and create a blockchain-enabled marketplace that connects customers, suppliers, and 3D printing facilities—essentially a digital-rights business—for any industry in which replacement parts are needed in a hurry. That would truly create new value—using blockchain to build a business that wasn’t possible before.

HOW SUPPLIERS SHOULD RESPOND

Each of the three pathways to value using blockchain requires a different approach and has varying implications for players across the A&D industry. Large firms can reduce labor costs by automating processes, but they need to have realistic savings expectations. Raw materials suppliers and OEMs that want to access intermediary profit pools must understand where to expect resistance and how to use leverage to force change. And more innovative companies can identify areas that are ripe for disruption and create new types of businesses.

THE BOTTOM LINE: Much of the hype around blockchain in A&D has focused on increasing the efficiency of supply chain processes. Clearly, some value could be unlocked by pursuing that path, but not as much as one might think. Disintermediating suppliers also holds potential for disruption, but significant friction will result as midtier suppliers respond to the threat. The third path, enabling new businesses and customer offerings, has significant potential to create value, provided companies address customers’ pain points and innovate to create a markedly better customer experience and new market economies. Blockchain holds significant potential, but it isn’t a solution in and of itself. Instead, it is a foundational technology that’s best used to solve problems and support new business models.

About the Authors

Matt Aaronson is a senior partner and managing director in the Chicago office of The Boston Consulting Group, and he leads the aerospace and defense topic. You may contact him by email at aaronson.matt@bcg.com.

Henry Caffrey is an associate director in the firm’s Chicago office and a core member of the aerospace and defense topic. You may contact him by email at caffrey.henry@bcg.com.

Steven Won is a principal in BCG’s Chicago office and a core member of the aerospace and defense topic. You may contact him by email at won.steven@bcg.com.

Jeff Ahlquist is a partner and managing director at BCG Digital Ventures in Seattle. You may contact him by email at jeffrey.ahlquist@bcgdv.com.

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