

Convergence of Big Data, Artificial Intelligence, and Blockchain for Competitive Advantage

by Deborah Dobson



In my opinion, there are three emerging technologies that will, if they haven't already, transform nearly every industry. These technologies are big data, the most mature technology, artificial intelligence (AI) that feeds off of big data, and blockchain. A fourth, Internet of Things (IoT) is generating a huge amount of big data, which AI can learn from. According to IHS, there were 15.4 devices connected to the IoT in 2015 and is expected to grow to 75.4 billion by 2025. One of the big concerns regarding IoT is the security challenges. Because of this, Samsung and IBM have been exploring building a distributed network of diverse devices based on a blockchain database.

Big data, artificial intelligence, and blockchain technologies are able to provide competitive intelligence professionals with the ability to leverage the data and to be able to process and gain insights to allow a company to make sound business decisions.

A competitive intelligence professional needs to learn about these technologies to understand how they can help their country stay competitive.

In this article, we will look at each of the technologies, the benefit and challenges of each, and how blockchain can be used to help a company stay competitive in the marketplace.

Big Data

Ninety percent of the world's data has been created in the last two years alone. IDC predicts there will be 44 zettabytes of data created by 2020 and believes the total will hit 180 zettabytes by 2025. This is due to the number of IoT devices now generating data as well as the number of sensors per device. There are approximately 11 billion devices connected to the Internet now, and this figure is to triple to 30 billion by 2020 and reach 80 billion by 2025.¹

Needless to say, the traditional data processing methods companies used for years cannot handle the volume, speed, and variety of the data being generated today. Datasets are simply too large and too complex to process. But due to decreased storage costs, big data technologies like Hadoop and algorithms, companies are embarking on big data projects.

There are four characteristics that make data "big data."

- **Volume:** The scale of data being created daily. Most companies in the U.S. have at least 100 Terabytes of data stored.
- **Velocity:** How fast the data is coming in. The New York Stock Exchange captures 1 Terabyte of trade information during each trading session.
- **Variety:** The different forms of data – structured and unstructured. Companies store emails, text messages, video, audio files, IoT data, and other formats.
- **Veracity:** Uncertainty of the data. One out of three business leaders don't trust the information they use to make decisions.

Big data technology is transforming the enterprise backend for many companies as they replace data warehouses with "data lakes" running big data software. A data lake is a storage repository that holds a vast amount of raw data in its native format, including structured, semi-structured, and unstructured data. A data warehouse holds structured data and is expensive for large data volumes while a "data lake" is designed for low cost storage.

The importance of big data lies not in how much data a company collects, but how it utilizes the data to change the way its business processes for:

- Cost savings
- Time reductions
- Customer experience improvements
- New product development

How John Deere Uses Big Data

John Deere is very focused on providing big data and IoT solutions that allow farmers to make informed decisions based on real-time analysis of captured data. The online portal myjohndeere.com allows farmers to access the data gathered from sensors attached to their machinery, as well as aggregated data from other users around the world. This enables a farmer to fine-tune farm operations for optimum production by analyzing data from thousands of farms working with many different crops in many different conditions.

Apple Siri is a great example of AI and big data impacting our personal lives. As millions of people interact with Siri, the AI is learning and improving in its accuracy and breadth of knowledge each day.



The system also minimizes equipment downtime by predicting, based on crowdsourced data, when and where equipment is likely to fail. Using this data, John Deere engineers are ready to supply new parts and service machinery when needed.

Big Data Challenges

Companies need to ensure their data is correct and accurate for its intended use. Bad data costs the U.S. economy \$3 trillion per year. According to Experian, the average company loses 12% of revenue due to bad data. This explains, why in a recent survey of over 2000 organizations by KPMG and Forrester Consulting, only 34% of business leaders felt 'very confident' about the insights they get from data. Also interesting to note, only 13% felt that their firm excels in privacy and ethical use of big data analytics, and around 70% thought this leaves their organization vulnerable to reputational risk.

While trust is an issue with big data, the exponential growth in the volume of data and the speed which is needed to analyze the data and make decisions makes it very challenging for a company to stay competitive in today's marketplace. This is where artificial intelligence (AI), also known as machine learning, can help. AI refers to machine intelligence. In other words, the ability for the machine to learn and solve problems.

Artificial Intelligence Meets Big Data

AI is not new. Alan Turing, British mathematician and WWII code-breaker, was one of the first people to come up with the idea that a machine can think. He even created the Turing test as a benchmark to determine a machine's ability to think like a human that is still used today.

In 2015, faster and powerful parallel processing became accessible attracting scientists and innovators to focus their attention on AI. This was around the same time as it became possible to store and analyze infinite amounts of data – big data.

One of the biggest requirements of AI is a huge data set. The larger the data set, the more the AI platform can learn from and the faster it can develop its own insights into what is actually happening. This steady diet

of big data means it is able to quickly provide decision makers with data-based models and simulations to make sound business decisions. I've seen the term "Big Data Intelligence" used which makes sense.

The most popular AI technologies for businesses are big data automation, predictive analysis, and machine learning according to InfoSys in its survey report, "Amplifying Human Potential: Towards Purposeful Artificial Intelligence". Some industries are adopting advanced deployments faster than others. The leading industries include pharma/life science, manufacturing, logistics, healthcare, automotive and aerospace, telecoms, energy, oil/gas and utilities, and financial services.

The biggest AI use case for a company includes automating job functions, improving business processes and operations, performance and behavior predictions, increasing revenue, pattern recognition, and business insight.

Convergence of AI and Big Data

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Tesla is another example of a company benefiting from this convergence. Tesla refers to it as "fleet intelligence."

While there are many benefits with an AI implementation, there are also business challenges that you need to consider when building a business case to present to leadership.

- **AI is expensive:** Purchase and installation/integration prices can be high, and there are ongoing costs of licensing, support, and maintenance that need to be considered.
- **AI has security and privacy concerns:** Because AI systems require massive amounts of data, cybersecurity is a concern. Privacy issues are also a concern given the collection of user information.
- **AI may disrupt employees:** While some employees may benefit from AI such as knowledge workers who



A Tesla owner who lived in Santa Cruz hills left his Tesla on autopilot and asked the car to drive him home. On the way home, there was a very sharp corner, not a hairpin, but still a very tight corner in the Santa Cruz hills. The first time he took that corner the Tesla almost went off the road going outside of the lane and the alert came on telling the owner to take control of the car. The owner did it the next day and the following day and within two weeks the car learned how to take the corner. Important to note that it wasn't just his car that learned how to take that corner, it was every Tesla. The experience of every individual user on this platform gets uploaded into the cloud to the software infrastructure of Tesla autopilot, and the entire fleet benefited from that process. Now any Tesla user can go around a similar turn and the car will understand how to take that corner.

are able to focus on higher-level strategic thinking as repetitive manual tasks are automated, other positions will be reduced or eliminated. New skill sets will be required.

Blockchain

"What the internet did for communications, blockchain will do for trusted transactions." – Ginni Rometty

Blockchain is poised to be the next major disruptive technology for virtually all industries. It is a peer-to-peer technology that protects the integrity of a digital piece of information. Bitcoin was built on blockchain technology, so it is easy to see why most companies think its relevance, if any, is as a payments technology. But this technology can be used for much more, such as online signature services, voting systems, and many other applications. Blockchain technology is distributed, permissioned, and secure.

Let's look at a simple example to understand the technology better. When I purchase a cup of coffee at my local coffee shop, I pay the clerk for the cup of coffee.

Once the transaction occurs, the transaction details are recorded in a ledger. This is the principle behind blockchain. A blockchain is a distributed database that multiple parties (called nodes) share and everyone in the blockchain network can trust. A blockchain network provides a mutually trusted, transparent way of sharing and transacting digital assets. Each node participating in a blockchain network maintains their own copy of the database.

What Makes Blockchain Secure?

Each transaction added to the database is considered a block. A transaction will only get added once the previous transaction has been added or fails. Each new block contains a cryptographic hash (unique fingerprint) of the previous block. This creates a chain that can always be validated by checking the hashes back to the original root block. All nodes are required to validate the transaction and provide consensus that the block can be added to the chain. This makes it virtually impossible to add a record unless all parties participating in the blockchain agree the record is valid. Because all records are chained together by their hash value, once



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committed to the chain, all records are immutable meaning they cannot be changed. It is impossible to alter a previous record with altering every node's copy of the chain. If one node is compromised, then it can no longer participate in the chain until it regenerates the true chain from the other nodes.

Digital assets are easier to forge than non-digital assets that require a secure system to ensure the asset is only used once. With blockchain, every time an asset is used

or consumed, the owner of the asset signs the transfer with a private cryptographic key. This key is unique to the owner and extremely difficult to forge. In order to initiate the transaction, the transferrer requires both the asset and their private key. The blockchain will check both the validity of the key and the ownership of the asset.

Therefore, even if the asset is cloned, it cannot be used without the private key. Once the transaction has been

committed to the chain, the owner of the asset will have changed. This means that if each node receives a second transaction that requests the transfer of ownership (or redemption), they will see that there was a previous transaction that already transferred the asset and will reject that transaction.

How Does Blockchain Ensure Privacy?

Personal data and identifiers are not required to be stored in the chain. Such data is stored as a hash value which provides both anonymity and security. The user may provide data such as their name, telephone number, email address, account ID, etc., but blockchain uses a combination of these values to determine the user's identity. This data is hashed to provide a unique token

that can only be recreated by providing the original values, and only this hash is stored to identify the user in the chain. Since it is impossible to obtain the input values by reverse engineering a hash value, the user is anonymous to all parties within the chain. If there is a need for validation, they simply provide the original values that were used to create the hash.

Blockchain and the Food Supply Chain

IBM is working with large food suppliers like Walmart, Dole, and Tyson to incorporate blockchain technology into the global food supply chain. This allows participants to share information rapidly and with confidence across a trusted network. One of the issues the companies are looking to address is food contamination. Blockchain provides an efficient way to figure out when and where food items are contaminated. This can potentially prevent major outbreaks of foodborne illnesses such as salmonella. IBM has started testing the technology with Walmart, which was able to track a product from a farm to the store shelves. This process, which has historically taken days or weeks, took only seconds.

Big Data, AI, and Blockchain

Big data transformed AI by providing the immense volume of data needed for AI to train on and learn. Blockchain could transform AI in some applications.

One of the limiting factors for companies in investing in big data/AI initiatives has been the cost of centralized storage providers which has exceeded budgets. Blockchain-based technology will likely make an impact in the cost of storing data due to the disintermediation of centralized storage providers. For a company, it should also create downward pricing pressure on SaaS suppliers as they need to move to decentralized storage providers to deal with the volumes of data.

While Blockchains help companies verify, execute, and record transactions of digital assets, AI helps find opportunities and improve decision making. And big data helps to feed AI the volume of data it needs to train on and build models. There are three characteristics of blockchain that can provide opportunities for AI.

- **Decentralized/Shared Control:** AI loves data. The more data it has to learn from, the better the models

which can help the company achieve higher profits, lower costs or other business goals. This means that there is an expansion of the concept of big data, moving from proprietary silos to blockchain-enabled shared data layers. Data sharing might occur across an enterprise, consortium or a public blockchain. For example, an enterprise can build AI models that predict customer churn; a consortium of banks could make better models to prevent credit card fraud.

- **Immutability/Audit Trail:** “Garbage in, garbage out” is a common problem companies have with data management. Bad data can come from an error, malicious act or due to a defective IoT sensor. Blockchain can help solve this problem. At each step of the process in building the AI model, the creator of the data time-stamps that model to the blockchain database, including a digital signature saying it is valid. This results in more trustworthy predictions.
- **Native Assets/Exchanges:** When you create data that can be used for model-building, and when you create models themselves, you can restrict how others use them upstream. Blockchain makes this easy for all use cases by treating permissions as assets. A user can grant read permissions or the right to view a particular slice of data or model. A good example of this is Google’s DeepMind’s healthcare AI which uses blockchain. A user simply owns their medical data and controls its upstream usage, therefore not putting the company at risk of regulation and antitrust issues.

Hanson Robotics’ Artificial Intelligence and Blockchain

The firm behind Sophia the robot is looking to take their cloud-based infrastructure for robot intelligence to the next level, launching a new project called SingularityNET. This project combines AI and blockchain technologies to create a decentralized, open market for AIs in the cloud, so anyone who develops AI can put it into SingularityNET and wrap it in Hanson Robotics cryptocurrency-based smart contract. This can help Sophia or any other robots or software programs that need AI. A “smart contract” is an agreement that is linked into the code of a platform automatically executing when the terms have been met. This eliminates the need for middlemen.

What Does This Mean for Competitive Intelligence Professionals?

Emerging technology provides a tremendous opportunity for the competitive intelligence professional to be able to provide data analytic insights with more trust than ever. While some are afraid that AI will replace them, I believe it will enhance the professional’s ability to provide better insights and predictions than before.

Blockchain and AI will transform enterprise data strategies for a company. It is imperative for a competitive intelligence professional to not only understand each of the technologies, including the role big data plays, but also to be a futurist thinker and leader in their company to help guide decision makers on how to leverage them.

- **Blockchain and AI require data sharing:** While blockchain relies on data sharing, AI applications can benefit from data sharing as well as the idea that with more data, the better the algorithm will be.
- **Blockchain and AI require security:** Both technologies introduce new infrastructure for security. Decentralized ledgers in blockchain and automated analysis and decision making in AI.
- **Blockchain and AI require trust:** Blockchain and AI systems must be auditable, adhere to compliance and regulation, and uphold secure identity access.

Those in the intelligence field play a critical role in helping their company leverage these technologies to be competitive in the marketplace.

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She writes a regular weekly blog post on blockchain for the International Legal Technology Association (ILTA) and has published articles on marketing technology in the Legal Marketing Association (LMA) publication *Strategies*. She also has presented at conferences and seminars on marketing technology and emerging tech. On February 1st, she was doing a presentation on blockchain at the 2018 LMATech West conference in San Francisco.

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