



Technologies With Potential to Transform Business and Business Education: Blockchain

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Introduction

Blockchain is a database technology that has the potential to disrupt numerous industries, including business education. Creative use of this technology could pave the way for significant shifts in higher education.

Education providers may benefit from the implementation of this technology in their own operations and should be aware of the potential ripples the technology could have on the way they interact with their stakeholders.

This brief provides a high-level overview on blockchain, how it is impacting businesses, and how it might lead to transformations within business education.

Note:

Throughout this brief, several prompts for consideration have been included following major sections. We encourage you to use these prompts to consider how blockchain may be impacting business education in your specific context, or to start conversations regarding blockchain with your peers.

Consideration Prompt 1:

What is your current understanding of blockchain?

Do you think blockchain will have a significant impact on business education in the near future?

What Is Blockchain?



Blockchain is more than just the underlying technology that enables the popular cryptocurrency, bitcoin. It can be applied to many different industries, in a variety of different ways. At its core, blockchain is an advanced database for record-keeping, which offers some significant benefits over alternative systems.

Beginnings

When discussing blockchain, many often think of bitcoin, the cryptocurrency created by Satoshi Nakamoto. Bitcoin was the first highly successful implementation of blockchain, which drew international attention.

Nakamoto released a paper, *Bitcoin: A Peer-to-Peer Electronic Cash System*, in 2008, which outlined his vision for the product. In it, he detailed how blockchain would enable bitcoin to be a viable, tamper-proof form of currency.¹ Shortly thereafter, bitcoin went public, releasing its first public ledger in January 2009. Bitcoin served as the first live case of blockchain at work.

Previous forms of online currency, such as Liberty Reserve, e-gold, and others, relied on a centralized database for their ledgers. This centralization, and lack of a tamper-proof means of security, opened the door for cybercrimes to be committed, at times defrauding users. These issues created distrust and ultimately resulted in the failure of many cryptocurrencies. But bitcoin's use of blockchain to create a decentralized database, with its numerous checks and balances, enabled it to overcome the problems previous cryptocurrencies could not. Blockchain was able to create trust among its users because it was "transparent, time-stamped and decentralized."²

¹ Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 2008, <https://bitcoin.org/bitcoin.pdf>.

² Bernard Marr, "A Very Brief History of Blockchain Technology Everyone Should Read," *Forbes*, February 16, 2018, <https://www.forbes.com/sites/bernardmarr/2018/02/16/a-very-brief-history-of-blockchain-technology-everyone-should-read/#6d6ed3567bc4>.



Beyond Bitcoin

Blockchain and bitcoin are far from being synonymous with one another. Sally Davies, a reporter for the *Financial Times*, put it best: “Blockchain is to Bitcoin, what the internet is to email. A big electronic system, on top of which you can build applications. Currency is just one.”³ There are many uses for blockchain that have nothing at all to do with cryptocurrency; despite being very effective as the backbone for a transactional ledger for bitcoin, many of these same benefits are just as applicable to other industries.

Consideration Prompt 2:

How are records, such as student transcripts, currently stored at your university?

How does your university currently prepare business students for data management?

³ Sally Davies, “How Bitcoin and Its Blockchain Work,” *Financial Times*, February 3, 2015, video, <https://www.ft.com/vid-eo/2be94381-66dc-3320-a292-6a1cde0a3d5f>.

How Does Blockchain Work?

As the name would imply, records are kept on platforms known as blocks and are arranged in a chain, one after the other. Whenever a new record is added to a blockchain, a new block is added to the end of the chain, linked to the block that had previously been at the end of the chain. As such, the database is continuously being added to, with the chain growing longer as new blocks are added.⁴

Block Composition

On each of these blocks, any type of record can be stored. This could be an invoice, information about a shipment, information about an individual (such as transcripts), or anything else that can be stored digitally.

A blockchain begins with a single block, called the genesis block. This block contains its stored data plus a unique identifying code called a hash. The hash takes the information that is digitally stored in the block and generates a unique string of letters and numbers from it. The hash is typically composed of a string of randomly generated values.⁵

Sample hash:

a948904f2f0f479b8f8197694b30184b0d2ed1c1cd2a1ec0fb85d299a192a447⁶

This hash is the block’s signature element, which can be thought of as a fingerprint of the data contained in the block, and it allows the block to be identified individually from any other blocks that are later added to the chain.

Starting with the second block and continuing with every block added to the chain thereafter, the blocks also contain the hash of the previous block in the chain. This means that, apart from the genesis block (which cannot store any prior block’s hash), each block is composed of three elements.

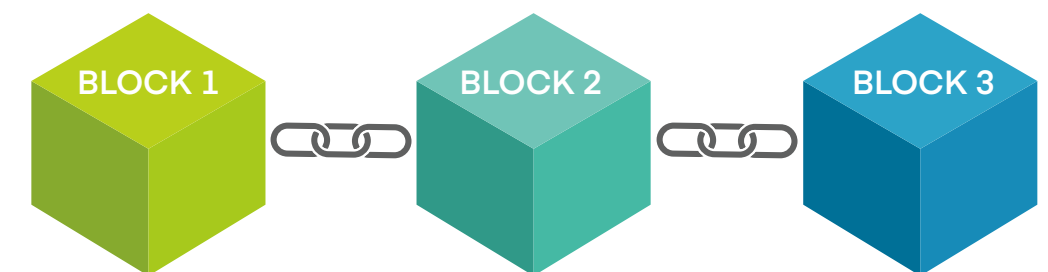


Figure 1: Blockchain Composition

Contents of each block:

- n Data stored in it
- n Block’s unique hash
- n Hash of the previous block in the chain (except for the genesis block, which has no prior hash)

⁴ Luke Fortney, “Blockchain, Explained,” *Investopedia*, updated February 10, 2019, <https://www.investopedia.com/terms/b/blockchain.asp>.

⁵ Fortney, “Blockchain, Explained.”

⁶ Maryanne Murray, “Blockchain Explained,” a Reuters Visual Guide, *Reuters*, June 15, 2018 <http://graphics.reuters.com/TECH-NOLOGY-BLOCKCHAIN/010070P11GN/index.html>.

These hashes are time dependent. If any changes are made to a block's data, a new hash will be generated for that block. If a single hash is changed, the subsequent block will no longer be properly connected (as the hash that had been assigned to it as its previous hash would no longer exist), breaking the chain. If a cybercriminal were to change a hash, they would break the entire chain, and all users of the blockchain would reject the criminal's version of the history. If they were to restore the hash, they would also have to restore the hash to the next block, and the next block after that, as all blocks are all connected. Attempting this resoration would take an enormous amount of computing power, as the cybercriminal would need to recalculate all the hashes in the chain.⁷

Decentralization

One of the other key features of the blockchain is that it is decentralized. Instead of a single entity maintaining control of the database, the database is transparently shared across all users. Blockchains can be used by a few users or by many users. But in any format, the decentralization of the database creates trust among partners, as each user plays a role in ensuring the integrity of the blockchain.

For example, if a blockchain were being used to track inventory between a supermarket and a distributor, both parties would have access to the blockchain. If the supermarket were to place an order with the distributor, adding a block to the chain containing this information, then the distributor would be notified that this change had occurred. And if one party wanted to modify the contents of a block earlier in the chain without first receiving approval from the other parties in the chain, they would be not be allowed to do so because of the other hashes that would be modified.

Consideration Prompt 3:

What are some use cases for this technology in business?

Do you know of any instances where this technology is currently being deployed?

⁷ Murray, "Blockchain Explained."

Impact in Business



Gennaro Cuomo, an expert on blockchain technologies with IBM, outlined three key reasons that blockchain is going to create a significant impact on businesses:

- n Time is saved because multi-party transactions can settle immediately, avoiding exhaustive reconciliation that often takes days or even months.
- n Cost is reduced because business-to-business processing eliminates overhead caused by intermediaries.
- n Risk is mitigated because the ledger acts as an immutable audit trail, greatly reducing the chances of tampering and collusion.⁸

As mentioned earlier, blockchain is already being deployed effectively with bitcoin. But numerous other businesses are also leveraging this technology.

Healthcare

An industry that has a great deal of parallels to business education in terms of how blockchain may be adapted is the healthcare industry. The way medical files for patients are collected and stored using blockchain could in some ways mirror the way student transcripts and certifications might one day be maintained in higher education.

⁸ *Beyond Bitcoin: Emerging Applications for Blockchain Technology*, House Committee on Science, Space and Technology, Subcommittee on Oversight & Subcommittee Research and Technology, 115th Cong., February 14, 2018 (Testimony of Mr. Gennaro "Jerry" Cuomo, IBM Fellow, Vice President Blockchain Technologies, IBM Cloud), <https://docs.house.gov/meetings/SY/SY21/20180214/106862/HHRG-115-SY21-20180214-SD004.pdf>, 45.

In the United States, patients see an average of 19 different physicians during their lifetimes. Additionally, most patient health records are contained on hundreds of different forms that are maintained in a variety of different filing systems (some physical, some digital), and these systems often do not natively communicate with one another.⁹ All of these different record systems create redundancies, with multiple clinics storing the same records and sending records back and forth, creating many opportunities for error, which could have serious health-related consequences.

Similarly, for someone practicing medicine, having their credentials shared across disparate organizations creates its own set of challenges. When a medical practitioner, such as a doctor, joins a hospital, they “must first have his or her credentials—educational history, licensures, regulatory history and more—confirmed, which could require contacting more than a dozen entities and take months.”¹⁰ The same process would apply for that doctor to join an insurance network, or any other area where their credentials would need to be verified.

According to PwC, physicians spend “more than \$2 billion a year maintaining provider databases, and each provider submits an average of 18 applications for credentialing a year.”¹¹ With blockchain, medical history—including both patient records and practitioner credentialing—could be securely managed through a blockchain. New physicians, when added to the blockchain, would have the complete picture of patients’ medical histories, without having to go to a multitude of specialists and practitioners for details. Similarly, hospitals would be able to access an incoming doctor’s records simply, in a cost-effective manner, and with full confidence.

Shipping

With most international shipping agreements currently, a single shipment of goods from one port to the other creates an enormous amount of paperwork, between many private enterprises and government agencies, tracking what is being shipped, the conditions, the price, and the people involved. This method of tracking strains the resources of all parties involved, as each stakeholder in the transaction is tracking the same shipment in their individual records.¹²

Maersk, a large global shipping company, intends to implement a blockchain “to help track in real-time millions of shipping containers across the world by providing a trusted, tamper-proof, cross border system for digitized trade documents.”¹³ Because blockchain is transparent and decentralized, stakeholders will no longer need to individually track the process or file disputes with one another over disagreements, as all the information will

⁹ “Survey: Patients See 18.7 Different Doctors on Average,” PR Newswire, April 27, 2010, <https://www.prnewswire.com/news-releases/survey-patients-see-187-different-doctors-on-average-92171874.html>.
¹⁰ “A Prescription for Blockchain and Healthcare: Reinvent or Be Reinvented,” PwC, 2018, <https://www.pwc.com/us/en/industries/health-industries/health-research-institute/blockchain-in-healthcare.html>.
¹¹ “A Prescription for Blockchain.”
¹² Cuomo, *Beyond Bitcoin*, 45.
¹³ Cuomo, *Beyond Bitcoin*, 45.

be logged in a single, open, immutable database—the blockchain. Cuomo believes that, when adopted at scale, this “solution has the potential to save billions of dollars,” and represents “the transformative power of blockchain applied to the shipping industry.”¹⁴

Farming

Blockchain may also have an impact on the farming and agriculture industry. Due to increasingly complex global supply chains, identifying the source of a contaminated food within a chain is quite difficult. In the United States and Canada in late 2018, the Centers for Disease Control warned about an E. coli contamination of romaine lettuce and urged consumers and suppliers to dispose of the lettuce, as it was potentially unsafe.¹⁵ Given the size of the United States and Canada, tracking the source of the contaminant was incredibly difficult, and it resulted in enormous amounts of waste.

Working with major food companies such as Walmart, Nestlé, and several others, IBM is proposing a blockchain solution that would “trace food as it moves from farm to table.” In this way, blockchain’s ability to increase transparency of the supply chain’s inputs would enable all parties to see the full picture of a product’s history as it moves from the farm to its destination. As such, it would be possible to quickly and safely identify the “source of contamination, reduce the impact of food recalls and limit the number of people who get sick or die from foodborne illness.”¹⁶

Other Fields

Cuomo shares that IBM has engaged in blockchain projects with hundreds of businesses, related to supply chain, financial services, government, healthcare, travel and transportation, insurance, chemicals and petroleum, and others, highlighting the diversity of industries that blockchain can impact.¹⁷

Consideration Prompt 4:

Given the use cases in other industries, how might higher education be able to leverage blockchain in its own operations?

Given the above changes in various business environments, how can educators give the best tools and information to their students?

¹⁴ *Beyond Bitcoin*.
¹⁵ “Outbreak of E. coli Infections Linked to Romaine Lettuce,” Centers for Disease Control, January 9, 2019, <https://www.cdc.gov/ecoli/2018/o157h7-11-18/index.html>.
¹⁶ House Committee, *Beyond Bitcoin*.
¹⁷ House Committee, *Beyond Bitcoin*.

Impact in Higher Education



Blockchain could impact higher education, including business schools, in ways that are more immediate and far-reaching than other commonly discussed technologies, such as artificial intelligence and virtual reality. While these technologies offer considerable potential for teaching and convening, blockchain could truly change the way the business of the business school is conducted.

Potential Uses of Blockchain

Teaching Blockchain

At a baseline level, business schools can begin teaching blockchain as part of their curriculum. Blockchain is a technology that has quickly growing interest in the business community, and graduates who possess an expertise in using a blockchain may become increasingly valued.

Incorporating blockchain into the curriculum could take many forms, such as a series of exercises, a course, or a full specialization, depending on the needs of a school's local context and student interests. Blockchain could be a new niche offering for business schools to differentiate themselves, just as business schools have embraced data analytics, e-business, and other tech-centered fields in recent years.

Certifications and Badges

Among the spaces where blockchain could change higher education the most is student credentialing. Although a nascent technology, blockchain is already being used by a few institutions "as a means to verify academic credentials like degrees, certificates, and transcripts."¹⁸

Blockchain has the capacity to give learners and providers more nuance over program takeaways, beyond just the certification of completion. Natalie Smolenski, a cultural anthropologist at Learning Machine, shares that the job of blockchain in higher education could be to track student learning, including "the value itself, who conferred it and to whom it was conferred."¹⁹ Tracking student learning could encompass outcomes such as a certificate, a badge, or even a newly learned competency.

If someone were to take a multitude of online courses, the credentials they earn could be logged into a blockchain, demonstrating the diversity of their learning profile. The learning profile could combine multiple forms of education into a single registry, including degrees earned, various badges, and other educational outcomes. A learning profile, stored on a blockchain, could be functionally similar to the manner in which the healthcare industry could begin using blockchain to organize and verify patient records.

This system already exists today. An example is the toolkit called Blockcerts. Blockcerts "lets users create, issue, view, and verify blockchain education credentials."²⁰ When a learner completes a certification for a program that is using Blockcerts, they submit their identification to the providing issuer (often a school) for confirmation. The issuer of the certification provides a confirmation that the learner has completed all the relevant requirements, and the certification is then added to the learner's blockchain.

For instance, an educational provider (be it a university, or a MOOC) could issue a badge to verify a student is competent at a particular subject matter that was covered in a course. Other opportunities exist for recognizing a learner's accomplishments, as well, "such as being a student tutor, that formal credentials rarely record."²¹

The use of blockchain for competency-based education depends on the level of nuance that education providers are comfortable offering to their learners. As specialization and non-degree courses grow in popularity, learners may begin to request a more nuanced breakdown of their learning outcomes to share with employers and for their personal records.

¹⁸ Stephen Pelletier, "Blockchain in Higher Education," *The Chronicle of Higher Education*, 2018, https://www.vaughn.edu/wp-content/uploads/2018/12/Blockchain_Oracle_Explainer_In_Higher_Education.pdf.

¹⁹ Gavin Moore, "Employing Blockchain in Credentialing Practices," Institute for Credentialing Excellence, updated September 5, 2018, <https://www.credentialingexcellence.org/blog/employing-blockchain-in-credentialing-practices>.

²⁰ David McArthur, "Will Blockchains Revolutionize Education?" *Educause Review*, May 21, 2018, <https://er.educause.edu/articles/2018/5/will-blockchains-revolutionize-education>.

²¹ McArthur, "Will Blockchains Revolutionize Education?"



University Operations

Blockchain has the potential to change some university functions, as well. It's possible that blockchain could become a standard format for issuing academic credentials, which would "eliminate the traditional role of the college registrar as the distribution point for such records."²² While this would also eliminate a university revenue stream, it could lower costs or enable those resources to be deployed elsewhere.

Additionally, the process of obtaining a certificate is usually based on a learner completing a series of criteria, such as achieving a certain level of performance academically. Typically, completion of these criteria is centrally verified by staff. This process can take time, as staff must ensure that each aspect of the criteria is legitimate (not fraudulent or inaccurate) prior to awarding the certification.

If, instead, the learner were to use a blockchain ledger to track their own learning, there would be no question of the criteria being misrepresented. Rather than using that central database system, imagine "that each piece of an individual's candidacy for certification is a 'digital badge' that is supplied by attesting institutions and is encoded into blocks on a certification authority's blockchain."²³ The use of blockchain in this way could allow staff who would otherwise be spending time verifying the authenticity of the criteria to instead focus on more critical tasks.

²² Pelletier, "Blockchain in Higher Education."
²³ Pelletier, "Blockchain in Higher Education."

Institutional Collaborations

There is also the potential for universities to use blockchain in their own operations when working with fellow institutions. Logging transactions such as faculty sharing, research agreements, or any other cross-institutional activity in a blockchain would provide a verified history of those interactions. Having these transactions logged in a blockchain would only become more valuable as educational providers continue to create more partnerships, sometimes across continents. Blockchain could be used by any set of affiliated organizations, providing them with an inexpensive, shared resource that provides historical tracking of the partnership and what it entails. Such a ledger could be very valuable for those coming into new positions, such as a deanship, providing them with a better understanding of the history of collaborations without having to rely solely on potentially outdated files or insight from colleagues.²⁴

Consideration Prompt 5:

What challenges do you foresee for the adoption of blockchain in higher education?

How might education providers in emerging markets benefit from the use of blockchain?

²⁴ Donald Clark, "10 Ways Blockchain Could Be Used in Education," *OEB Insights*, September 12, 2016, <https://oeb.global/oeb-insights/10-ways-blockchain-could-be-used-in-education/>.

Obstacles for Blockchain Adoption



While this brief has focused predominately on the upsides that blockchain can offer institutions, the technology will need to overcome several obstacles for it to become a mainstream tool used by business schools.

One challenge is that there are different standards for how a blockchain should be constructed, even though the underlying principals are largely the same. Analysis from Riga Technical University in Latvia has found that Europeans are favoring the blockchain design used by Ethereum, which is somewhat different from the blockchain used by bitcoin, which is popular in the United States. The Blockcerts application discussed earlier, for instance, is unavailable using the Ethereum blockchain method. Given the global nature of business education, finding a globally acceptable standard for blockchain would be critical for its adoption in the industry.²⁵

Additionally, while blockchain is already in use in several areas, the technology is not entirely refined and will likely continue to be developed in the coming years. Education providers could benefit from waiting for blockchain to stabilize in other industries, prior to investing in the incorporation of it into their programming and operations.

²⁵ Derek Newton, "How Blockchain Will Come to Campus," *Forbes*, September 17, 2018, <https://www.forbes.com/sites/dereknewton/2018/09/17/how-blockchain-will-come-to-campus/#1e3dff47488d>.

Another potential issue for blockchain would be the transferring of older records in the blockchain. If the blockchain, for credentialing purposes, is intended to show a learner's history, those who were already well into their career would be at a disadvantage unless their competencies and certifications were retroactively added in the blockchain. Considering the complications this would cause, and other similar challenges, governance by education providers will be critical. These governance "challenges will require a concerted effort to ensure that the standards for digital credentialing systems are open and that they take into account the needs of all involved—learners, educational institutions, employers and governments."²⁶

Ultimately, adopting blockchain at scale in the business education industry would require "wide-ranging business process change, with the technological component being only a small part of its implementation."²⁷

²⁶ *Blockchain Goes to School*, Cognizant, March 2019, <https://www.cognizant.com/whitepapers/blockchain-goes-to-school-codex3775.pdf>.

²⁷ *Blockchain Goes to School*.

Last Word

Blockchain will require a significant commitment to implement properly, with numerous costs, structural changes, and other considerations involved. But the substantial advantages that blockchain offers, as evidenced by its use in other industries, demonstrates the value of investigating this technology for higher education providers. Whether blockchain, as we know it today, is the technology that ultimately breaks into higher education is uncertain. Regardless, blockchain has demonstrated the promise of a decentralized means for record-keeping, and education providers should take note, as this is a technology that could impact them soon.

References

PwC. "A Prescription for Blockchain and Healthcare: Reinvent or Be Reinvented." 2018. <https://www.pwc.com/us/en/industries/health-industries/health-research-institute/blockchain-in-healthcare.html>.

Cognizant. *Blockchain Goes to School*. 2018. <https://www.cognizant.com/whitepapers/blockchain-goes-to-school-codex3775.pdf>.

Center for Disease Control. "Outbreak of E. coli Infections Linked to Romaine Lettuce." January 9, 2019. <https://www.cdc.gov/ecoli/2018/o157h7-11-18/index.html>.

Clark, Donald. "10 Ways Blockchain Could Be Used in Education." OEB Insights. September 12, 2016. <https://oeb.global/oeb-insights/10-ways-blockchain-could-be-used-in-education/>.

House Committee on Science, Space and Technology, Subcommittee on Oversight & Subcommittee Research and Technology, 115th Cong. February 14, 2018. Testimony of Mr. Gennaro "Jerry" Cuomo, IBM Fellow, Vice President Blockchain Technologies, IBM Cloud. *Beyond Bitcoin: Emerging Applications for Blockchain Technology*. <https://docs.house.gov/meetings/SY/SY21/20180214/106862/HHRG-115-SY21-20180214-SD004.pdf>.

Fortney, Luke. "Blockchain, Explained." *Investopedia*. Updated February 10, 2019. <https://www.investopedia.com/terms/b/blockchain.asp>.

Marr, Bernard. "A Very Brief History of Blockchain Technology Everyone Should Read." *Forbes*. February 16, 2018. <https://www.forbes.com/sites/bernardmarr/2018/02/16/a-very-brief-history-of-blockchain-technology-everyone-should-read/#6d6ed3567bc4>.

McArthur, David. "Will Blockchains Revolutionize Education?" *Educause Review*. May 21, 2018. <https://er.educause.edu/articles/2018/5/will-blockchains-revolutionize-education>.

Moore, Gavin. "Employing Blockchain in Credentialing Practices." Institute for Credentialing Excellence. Updated September 5, 2018. <https://www.credentialingexcellence.org/blog/employing-blockchain-in-credentialing-practices>.

Murray, Maryanne. "Blockchain Explained." A *Reuters* Visual Guide. Reuters. June 15, 2018. <http://graphics.reuters.com/TECHNOLOGY-BLOCKCHAIN/010070P11GN/index.html>.

Nakamoto, Satoshi. "Bitcoin: A Peer-to-Peer Electronic Cash System." 2008. Bitcoin.org. <https://bitcoin.org/bitcoin.pdf>.

Newton, Derek. "How Blockchain Will Come to Campus." *Forbes*. September 17, 2018. <https://www.forbes.com/sites/dereknewton/2018/09/17/how-blockchain-will-come-to-campus/#1e3dff47488d>.

PR Newswire. "Patients See 18.7 Different Doctors on Average." April 27, 2010. <https://www.prnewswire.com/news-releases/survey-patients-see-187-different-doctors-on-average-92171874.html>.

Shen, Lucinda. "Blockchain Will Be Used by 15% of Big Banks by 2017." *Fortune*. September 28, 2016. <http://fortune.com/2016/09/28/blockchain-banks-2017/>.

Pelletier, Stephen. "Blockchain in Higher Education." *The Chronicle of Higher Education*. 2018. https://www.vauhn.edu/wp-content/uploads/2018/12/Blockchain_Oracle_Explainer_In_Higher_Education.pdf.

Recommended Reading

Blockchain adoption in various fields:

Business

PwC. "Blockchain Is Here. What's Your Next Move?" 2019, <https://www.pwc.com/gx/en/issues/blockchain/blockchain-in-business.html>.

Commercial Real Estate

Deloitte. *Blockchain in Commercial Real Estate: The Future Is Here!* 2017. <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-dcfs-blockchain-in-cre-the-future-is-here.pdf>.

Logistics

DHL Trend Research. *Blockchain in Logistics*. Troisdorf, Germany: DHL Customer Solutions & Innovations, 2018. <https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-blockchain-trend-report.pdf>.

Potential for blockchain:

Galen, Doug J., Nikki Brand, Lyndsey Boucherle, Rose Davis, NatalieDo, Ben El-Baz, Isadora Kimura, Kate Wharton, and Jay Lee. *Blockchain for Social Impact: Moving Beyond the Hype*. Stanford Graduate School of Business, Center for Social Innovation. April 11, 2018. <https://www.gsb.stanford.edu/faculty-research/publications/blockchain-social-impact>.

Challenges for blockchain:

Higginson, Matt, Marie-Claude Nadeau, and Kausik Rajgopal. "Blockchain's Occam Problem." McKinsey & Company. January 2019. <https://www.mckinsey.com/industries/financial-services/our-insights/blockchains-occam-problem>.



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