

Teppo Felin
Karim Lakhani

What Problems Will You Solve With Blockchain?

Before jumping on the bandwagon, companies need to carefully consider how ledger technologies fit into their overall strategy.

WHAT PROBLEMS WILL YOU SOLVE WITH BLOCKCHAIN?

Before jumping on the bandwagon, companies need to carefully consider how ledger technologies fit into their overall strategy.

BY TEPPU FELIN AND KARIM LAKHANI

DISTRIBUTED LEDGER TECHNOLOGIES — collectively known as blockchain — have burst onto the business scene, accompanied by a significant amount of hype.¹ They are widely expected to disrupt existing industries and lead to the creation of new types of companies.

Some of the excitement may indeed be warranted, but only if organizations focus on how these technologies can be used to support their strategy. Without that lens, companies risk making large investments in initiatives that don't create meaningful value.

However, with careful planning, businesses can use blockchain to gain an edge over rivals in a number of ways. It can provide a foundation for powerful applications that will streamline core operations. Distributed ledger technologies can lower transaction costs and make intellectual property ownership and payments more transparent, seamless, and automated. But companies should resist jumping on the bandwagon until they first understand



THE LEADING QUESTION

How can companies strategically benefit from blockchain?

FINDINGS

*For both startups and incumbents, distributed ledger technologies can enable new business and operating models.

*They can also help companies disrupt existing industries.

*To create value, companies need to systematically link blockchain technology with their strategy and capabilities.

what specific problems they can solve with blockchain — and for whom. How will it help them reach new customers? How can it improve efficiency or transparency in their supply chains? And most important, what will blockchain enable them *to do* that competitors and new entrants *can't do*? Answering these sorts of practical, targeted questions will allow businesses to cut through the hype and create a blockchain strategy that makes sense for them.

To begin, it's critical to understand the basic uses and functionalities of blockchains, which tend to get lost in the buzz. So we will provide a quick primer on digital ledgers before discussing how companies should build powerful problem-solving applications that are uniquely configured to their own strategies.

The Power of a Ledger

The first known ledgers date back some 5,000 to 10,000 years to Mesopotamia, where simple clay tokens and stone tablets were used as markers of transactions.² They were a centralized form of record keeping that helped people keep track of things like the price of barley, who bought the barley from whom, or who owned or purchased a piece of land.³

Over time, such ledgers formed the basis of wide-scale economic development and activity. They allowed people to gauge who could be trusted, leading to the emergence of reputation, credit, and long-distance trade. Moreover, they helped resolve disputes about goods sold and money owed.

In their simplest form, blockchains are the digital equivalent of the old stone ledgers. They are memory devices — a kind of database — for recording and verifying transactions and terms of engagement. Just like their ancient counterparts, they can record information about any number of things: who owns a specific asset, who bought a particular product from whom, or who has the right to make a certain type of decision. And all of this information can be aggregated to develop insights about, say, the reputations of parties involved or the origins of the supply chain of a particular commodity.

What makes blockchains so powerful, however, is the fact that they are distributed and digital. Rather than having to physically record transactions in one place, any authorized party can be

given access to either the entire ledger or specified portions. As transactions take place between parties, the distributed digital copies of the ledger are instantly and simultaneously updated, and the record of each transaction is indelibly recorded through advanced computational algorithms and cryptographic locks. Depending upon the rules of the particular blockchain, participating parties can be either identified or anonymous. The decentralized nature of the ledger means that parties can more easily interact with each other — and have confidence that the record of the interactions will be fully memorialized.

Problems That Blockchain Can Address

In creating a blockchain, organizations need to define the specific problem they are trying to solve. Then they must determine which transactions or interactions the blockchain should capture and who should have access to which portions. (See “Key Questions for Companies Designing Blockchains,” p. 36.) Blockchains can be scaled and used to interact with any number of different stakeholders, whether customers, employees, suppliers, or other companies. Verification is a key benefit.

Take the seemingly simple task of verifying someone's educational or employment credentials. A frequent problem employers face is that anyone can claim on a LinkedIn profile or on a CV that he or she completed a degree at a particular university or worked for a particular company. A blockchain identity solution could automatically verify an individual's credentials for relevant third parties.

The types of problems that blockchains can solve are far-ranging, spanning many industries and contexts. Here we will explore just a few common examples.

Paying for contributions to intellectual property. The video game industry offers a useful window into what's possible when you define a problem that a particular set of stakeholders face — and then design a blockchain to solve the problem. In this case, the stakeholders were the people contributing their creativity and smarts to developing games. And the problem was the cumbersome, archaic way in which royalties and rights were managed across the industry.

ABOUT THE RESEARCH

This article builds directly on the authors' respective research and teaching in the areas of strategy and digital innovation, which are fundamental to thinking about blockchain. Teppo Felin has researched and written about problem-solving and open versus closed innovation for several years, while Karim Lakhani has been studying and writing about the challenges and opportunities of innovation contests, digital transformation, and open innovation. The basic framework and examples of this article emerged as the authors developed course materials related to blockchain. They have recently taught courses on blockchain strategy at Oxford's Saïd Business School and on digital innovation and transformation at Harvard Business School.

Developing a video game typically involves production companies and game-publishing houses (such as Sony Interactive Entertainment, Tencent Games, Microsoft Studios, and Electronic Arts), development companies, video game console makers, computer manufacturers, and mobile phone makers, as well as contractors — writers, voice actors, composers, musicians, and so on.

For instance, development of the multibillion-dollar hit *Grand Theft Auto V* (which has grossed \$6 billion in revenues between 2013 and 2018), while credited to Rockstar North, a small company based in Scotland, was actually the work of more than a thousand people from many different companies and corporate sub-entities, as well as scores of contractors. To orchestrate all of this, companies have traditionally relied on idiosyncratic agreements and cumbersome one-off payments to compensate their myriad partners. The use of royalties — and the intricacies of how to manage and distribute these payments — has further complicated the picture. Until recently, developers, actors, and other contributors have had little sense of the size of the royalty they might be entitled to. Moreover, the payments often took months or longer to arrive.

Microsoft and Ernst & Young (EY) studied these inefficiencies and designed a blockchain to address the problems and provide transparency.⁴ The intellectual property blockchain they created enables companies and individuals to clearly specify, account for, and track the attribution of digital content throughout the network of stakeholders involved in the development and release of a video game. Using the blockchain, authorized participants can see a breakdown of royalty payments — as well as data about sales and distribution — on a real-time basis. The blockchain also allows for the easy creation of “smart contracts,” which can specify and enforce rates of payment and other terms. This automates processes that previously were extremely

labor-intensive, opaque, and costly. Legal and royalty negotiations can now be simplified with a menu of licensing and revenue-sharing options, and agreements can be implemented quickly and transparently.

Of course, the long-term success of this venture will depend on many factors, such as the incentives for others in the industry to adopt this particular blockchain. (If adoption isn't widespread, the blockchain becomes less powerful.) Still, Microsoft is likely to reap some benefits, as it now can interact more efficiently with the large ecosystem of developers, particularly those who develop games for its Xbox platform.

To be sure, Microsoft and EY aren't the only ones tackling problems related to the management of intellectual property, digital rights, and knowledge work. A plethora of companies have been looking at this area from one perspective or another. In music, for example, Mycelia, a blockchain initiative launched by British musician and record producer Imogen Heap, is attempting to become a digital management platform for musicians, helping them manage contracts, allocate payments, and track their creative works.⁵ (For similar examples, see “Blockchain Is Changing How Media and Entertainment Companies Compete,” p. 39.)

Establishing history of ownership. In addition to addressing problems related to intellectual property and licensing, blockchain is being used to establish origins and ownership. Consider the diamond industry, which has long been subject to corrupt activity. In western and central Africa, for example, rebel groups have used “blood diamonds” to finance armed conflicts against governments. In response, the diamond industry has attempted to create provenance certification programs. The proper tracking of diamonds could bring much-needed transparency to the industry, ensuring that blood diamonds do not support insurgents' efforts by preventing the gems from entering the supply

KEY QUESTIONS FOR COMPANIES DESIGNING BLOCKCHAINS
 By examining what they are trying to do with blockchain, what value they want to capture with it, and which stakeholders they hope to serve, companies can use the technologies to solve strategic problems in a more targeted way.

WHAT ARE YOU TRYING TO DO?	WHAT VALUE DO YOU WANT TO CAPTURE?	FOR WHOM?
<ul style="list-style-type: none"> • Record • Track • Verify • Aggregate 	<ul style="list-style-type: none"> • Information and knowledge • Attribution and responsibility • Access or permission • Decision rights or votes • Ownership or incentives • Reputation and trust • Contracts • Transactions 	<ul style="list-style-type: none"> • Customers • Employees • Suppliers • Producers or makers • Creditors or investors • Governments • Citizens



chain in the first place. However, these efforts haven't been easy, as paper-based certification systems are prone to fraud and corruption.

London-based Everledger is one company attempting to address this type of problem using blockchain. Everledger offers provenance tracking and verification for a variety of luxury goods, providing new value to industry players and reassuring customers concerned about the source and quality of their goods. It claims to have added more than 1 million diamonds to its blockchain, allowing it to track not only their origination but also the entire chain of custody up to present ownership. Through blockchains, Everledger seeks to reduce the more than \$2 billion cost of annual jewelry fraud and bring transparency and authenticity to the diamond trade. Various jewelry companies, including De Beers and Hong Kong-based Chai Tai Fook, have launched similar efforts.

Making supply chains more efficient and transparent. The ability to track provenance can address another type of problem: reducing the

amount of inefficiency and lack of clarity in supply chains. In early 2018, the Danish shipping giant Maersk and IBM announced a joint venture to create a real-time digital ledger for global shipping. The cargo, transport, and shipping industry has long suffered from a lack of transparency with regard to the sourcing and timing of shipments, which public ledgers might be able to solve.

Other companies are developing their own distributed ledgers to cover their entire supply chains. Walmart provides a good example. For decades, a critical aspect of Walmart's competitive advantage has been its point-of-sale inventory system, which allows the company to track information about sales in real time so it can quickly adapt its product mix to local needs and trends. However, a distributed ledger will extend this advantage by recording the origins of raw materials and products in the supply chain. This will also allow for more transparent consumer labeling and answer questions about sustainability in a more timely and detailed fashion.

Walmart has already started to use blockchain

to track the provenance of mangoes as they are shipped from Mexico to the United States and to track its pork supply chain in China. The company says its distributed ledger has shortened the time to track produce from six days to two seconds, which helps solve several problems having to do with food safety, customs and regulatory filings, and automated payments.⁶ For example, the ability to automatically and systematically track food origins will allow Walmart to quickly identify the source of, say, an *E. coli* outbreak — thereby reducing the potential for a major crisis.⁷

In a similar vein, Chinese online retailer JD.com has begun to pilot the use of blockchain to track its beef supply chain from Australia to China and address the problems of food contamination, misrepresentation, brand erosion, and product theft. More generally, logistics and package delivery companies such as UPS, FedEx, and DHL are actively using distributed ledgers to optimize and create transparency in supply chains and delivery systems so that they can better serve both their business customers and consumers with full origin tracking.

Blockchain and Your Strategy: Three Aspects of Uniqueness

As excitement over blockchain spreads, established players and new entrants across many industries are actively searching for ways to utilize the technologies.⁸ But it's worth noting that any new technology — even one that might seem like a radical breakthrough — is a recombination of old solutions and insights. Take Bitcoin. Many of its basic applications (for example, time stamping and cryptography) existed years before its founding in 2008.⁹ However, Bitcoin has reconfigured existing technologies and insights in novel ways, thus enabling new forms of problem-solving.

Companies likewise need to understand how to configure, design, and use blockchain technologies in unique ways. Some may be tempted to adopt a wait-and-see attitude regarding blockchain and become late adopters. Understandably, many managers will worry that large investments in the technologies will outpace the gains.¹⁰ That's a valid concern. But blockchains promise to be as fundamental as the internet in shaping how future business will be conducted. Therefore, a wait-and-see attitude could be costly.

Unfortunately, there's no easy answer for how any particular company should utilize or implement blockchain — if there were, everyone would be doing it. So, where should managers begin? In our view, companies can go a long way toward developing the right approach to blockchain by carefully considering three aspects of uniqueness: their strategy, the capabilities they bring, and the problems they can solve for stakeholders. These three aspects are mutually reinforcing, and it's in the interactions between them that companies can create significant value above and beyond what competitors might be doing.

A company's strategy is its distinctive point of view about how to create and capture value — it's the one thing that can't be outsourced.¹¹ For starters, then, companies need to think their strategy through to ensure it embodies their beliefs and hypotheses about the emergence of new markets and the possibility of new products that have yet to be imagined.

Although companies can create value by cooperating and interacting with others, such interactions should be organized in unique ways. And it's here, at the nexus of uniqueness and cooperation, that blockchains have the potential to generate significant value. For example, partnerships such as the Microsoft and EY blockchain initiative discussed earlier can be seen as a targeted form of “open innovation” that enables different organizations and individuals to take advantage of their respective strengths in conjunction with others.¹² Microsoft brings a vast mix of resources and past gaming industry experience to this collaboration, and EY brings its own set of resources. A joint effort thus can create significant value beyond what either company might be able to do alone. But such partnerships need to be carefully crafted to suit the particular circumstances. Companies must determine what *they* bring to the table and how blockchains can support their strategy in ways that are not foreseen by others, and then design and use blockchains accordingly — whether working alone or in collaboration with others.

Next, the strategy needs to be linked to the company's unique capabilities and resources. Established businesses often develop capabilities over time as they interact with their suppliers, customers, and stakeholders. Small companies and startups often have difficulty replicating these

capabilities (particularly in areas such as marketing, human resources, and finance). Rather than being caught off guard by new entrants, companies should review their existing resources and look for ways to leverage them with blockchain. Understanding one's capabilities is essential to the implementation of blockchain solutions. Again, companies need to bring something distinctive to the table beyond simply "buying" the technology and skills.

Finally, uniqueness relates to the problems that the company is attempting to solve for its customers and other stakeholders. That's where there tends to be a lot of low-hanging fruit and where blockchain technology can potentially be operationalized relatively quickly. Companies should consider how the technology can enable faster, more efficient interaction or increased transparency for their customers or suppliers.

A simple exercise for managers is to carefully list the problems that the company is currently solving or grappling with as they relate to different stakeholders. For each problem, managers can explore in parallel how the previously discussed uses of blockchain (for recording, tracking, verifying, and aggregating) might improve existing practices. Thinking about how various activities can help solve problems — for customers, employees, and suppliers — and carefully unpacking those activities, step by step, will help managers identify blockchain solutions that can generate real value.

The buzz around blockchain probably won't subside any time soon. But companies can get beyond it by taking the time to understand what the technologies are capable of doing and then systematically configuring blockchains in ways that align with their unique strategy, their existing capabilities, and the problems they can solve.

Teppo Felin (@teppofelin) is a professor of strategy at the University of Oxford's Saïd Business School. **Karim Lakhani** (@klakhani) is the Charles E. Wilson Professor of Business Administration at Harvard Business School and cofounder of its Digital Initiative. Comment on this article at <http://sloanreview.mit.edu/x/60115>.

REFERENCES

1. M. Iansiti and K.R. Lakhani, "The Truth About Blockchain," Harvard Business Review 95, no. 1 (January-February 2017): 118-127.

2. S. Basu, J. Dickhaut, G. Hecht, K. Towry, and G. Waymire, "Recordkeeping Alters Economic History by Promoting Reciprocity," Proceedings of the National Academy of Sciences of the United States of America 106, no. 4 (2009): 1009-1014; and S. Basu and G.B. Waymire, "Recordkeeping and Human Evolution," Accounting Horizons 20, no. 3 (2006): 201-229.

3. D. Snell, "Ledgers and Prices: Early Mesopotamian Merchant Accounts" (New Haven, Connecticut: Yale University Press, 1982).

4. J.J. Roberts, "Microsoft and EY Launch Blockchain Tool for Copyright," Fortune, June 20, 2018.

5. I. Heap, "Smart Contracts for the Music Industry," Medium, March 14, 2018.

6. A. Alexandre, "Walmart Is Ready to Use Blockchain for Its Live Food Business," Cointelegraph, April 24, 2018.

7. S. O'Neal, "From Pork to Diamonds: How Blockchain Is Making the Logistics Industry Transparent," Cointelegraph, April 26, 2018.

8. T. Felin and T.R. Zenger, "Strategy, Problems, and a Theory for the Firm," Organization Science 27, no. 1 (2016): 222-231; K.R. Lakhani, H. Lifshitz-Assaf, and M.L. Tushman, "Open Innovation and Organizational Boundaries: Task Decomposition, Knowledge Distribution, and the Locus of Innovation," in "Handbook of Economic Organization," ed. A. Grandori (Cheltenham, United Kingdom: Edward Elgar, 2013), 355-382; and E. von Hippel and G. von Krogh, "Identifying Viable 'Need-Solution Pairs': Problem-Solving Without Problem Formulation," Organization Science 27, no.1 (2016): 207-221.

9. A. Narayanan and J. Clark, "Bitcoin's Academic Pedigree," Communications of the ACM 60, no. 12 (December 2017): 36-45; and A. Narayanan, J. Bonneau, E. Felten, A. Miller, and S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" (Princeton, New Jersey: Princeton University Press, 2016).

10. E. Brynjolfsson, "The Productivity Paradox of Information Technology," Communications of the ACM 36, no. 12 (December 1993): 66-77; and E. Brynjolfsson, D. Rock, and C. Syverson, "Artificial Intelligence and the Modern Productivity Paradox," working paper no. 24001, National Bureau of Economic Research, Cambridge, Massachusetts, November 2017.

11. T. Felin and T. Zenger, "What Sets Breakthrough Strategies Apart," MIT Sloan Management Review 59, no. 2 (winter 2018): 86-88.

12. D. Harhoff and K.R. Lakhani, eds., "Revolutionizing Innovation: Users, Communities and Open Innovation" (Cambridge, Massachusetts: MIT Press, 2016); and T. Felin and T. Zenger, "Closed or Open Innovation?: Problem Solving and the Governance Choice," Research Policy 43, no. 5 (June 2014): 914-925.

Reprint 60115.

Copyright © Massachusetts Institute of Technology, 2018. All rights reserved.



PDFs ■ Reprints ■ Permission to Copy ■ Back Issues

Articles published in MIT Sloan Management Review are copyrighted by the Massachusetts Institute of Technology unless otherwise specified at the end of an article.

MIT Sloan Management Review articles, permissions, and back issues can be purchased on our website: sloanreview.mit.edu or you may order through our Business Service Center (9 a.m.-5 p.m. ET) at the phone numbers listed below. Paper reprints are available in quantities of 250 or more.

Reproducing or transmitting one or more MIT Sloan Management Review articles by electronic or mechanical means (including photocopying or archiving in any information storage or retrieval system) **requires written permission.**

To request permission, use our website: sloanreview.mit.edu
or

Email: smr-help@mit.edu

Call (US and International): 617-253-7170 Fax: 617-258-9739

Posting of full-text SMR articles on publicly accessible Internet sites is prohibited. To obtain permission to post articles on secure and/or password-protected intranet sites, email your request to smr-help@mit.edu.