



Gartner®

Executive Guidance

Get to Know Blockchain

**Unlock the value for your
business, now and tomorrow**

Foreword by David Furlonger and Christophe Uzureau

The promise of blockchain

Digital advances have enabled businesses to streamline a plethora of interactions between customers and value chain partners. Yet many information-heavy processes still require multiple entities to exchange private documents, and the methods for doing so remain unsecure, error-prone and fraud-ridden.

As a real-world example, consider the information required to allow a piece of real estate to change hands from one owner to another. From the buyer's mortgage and insurance documents to the property's inspection report and title review, these details contain personal information about high-value assets — some of it redundant and some of it unneeded by certain parts of the value chain. And yet these documents, which are reviewed manually, are passed around via email or placed on a third-party portal outside the control of the buyer and the seller.

Sweden's Lantmäteriet, the government agency responsible for regulating real estate, believes there is a better way. The agency is building a blockchain solution to connect the

various participants of the real estate value chain. Buyers, sellers, mortgage lenders, real estate brokers and agents, law firms, property developers and private buyers will have their interactions with the agency streamlined. The goal is to reduce the time delays and information security issues that breed fraud and high processing costs in the real estate sectors. The Lantmäteriet estimates a potential annual savings of \$106 million.

Immature solutions are temporary

Real estate is just one industry among dozens looking to blockchain as a solution to the challenges and opportunities of doing business in digital environments. The technology promises to allow any individual or commercial entity in the world to safely transact with any other, without needing a bank, insurance company, logistics provider or other intermediary between them.

Blockchain allows any individual or commercial entity in the world to safely transact with any other without an intermediary.

When this promise is realized, it will enable dramatic expansion of markets; it will provide better tools to manage expensive and opaque processes; and it will enable trade in a broad range of assets that, until now, couldn't be effectively represented, priced or traded with existing means. The technology could generate as much as \$3.1 trillion in new business value by 2030.

Gartner predicts blockchain could generate as much as \$3.1 trillion in new business value by 2030.

The current practice of building and using blockchain is immature, however. Many solutions called “blockchain” on the market today only incorporate some of the elements of the technology, and therefore only realize some of its value.

The dominance of these immature solutions is temporary. Blockchain will quickly mature and evolve along the Gartner Blockchain Spectrum — from the current-day blockchain-inspired solutions that include only some elements, to the fully realized blockchain-complete solutions we expect to see beginning in 2023, and the enhanced blockchain solutions by 2030 that will incorporate the Internet of Things (IoT) and artificial intelligence (AI).

For readers who plan to wait until blockchain evolves further along the Gartner Blockchain Spectrum, we urge you to reconsider. Blockchain is not a way station on the road to increased digitalization. It is a paradigm shift in how businesses, customers and partners interact and exchange value. The time to develop the in-house skills needed to build and manage blockchain platforms is now. Equally important are the additional organizational and leadership capabilities needed to engage in this new way.

Those who wait until the later phases of the Gartner Blockchain Spectrum to engage will be shut out of opportunities to learn, earn value and influence blockchain's development in the value chain.

To help you understand blockchain and how to unlock your share of its value, this Executive Guidance will clarify what blockchain is, what it enables businesses to do that can't be done with other technologies and how it will continue to evolve over the next 10 years.

Contents

CHAPTER 1



What Is Blockchain?

CHAPTER 2



The Gartner Blockchain Spectrum

CHAPTER 3



The Blockchain Society



What Is Blockchain?

Blockchain as a paradigm shift

In its simplest terms, blockchain makes it possible for two or more people, businesses or computers that may or may not know each other to exchange value in digital environments without having an intermediary like a bank between them validating and protecting the transaction.

Blockchain will move the world economy away from the slow, expensive, analog methods used since the 19th century to mediate financial transactions.

The potential impact on business volume is massive. Imagine all the business deals your firm won't or can't do today because you don't know who is on the other end of the transaction and can't be sure they own the assets they want to trade. For millions of potential trading partners, asset types and transactions, that uncertainty will cease to matter. The blockchain will identify participants and ensure all elements of a transaction are valid. It will enforce its rules and ensure everyone holds to them. If its potential is realized, blockchain will move the world economy away from the slow, expensive, analog-based methods we have relied on since the 19th century to establish identity and legal status in financial transactions.

Blockchains create this trusted digital environment by combining existing technologies and techniques to form a distributed digital ledger that captures and records the information needed by participants in a network to interact and transact. The blockchain confirms who the participants are and validates that they own the assets they want to exchange. It then records the transaction information to the ledger, a copy of which is independently updated and held by each participant. Records are unchangeable, time-stamped, encrypted and linked to each other in blocks.

Making digital processes both safe and transparent

Consider how valuable this could be for a task as universal and mundane as filing taxes. In the U.S., a quarter of a million taxpayers in 2017 had their refunds stolen when fraudulent returns were filed in their name. Such a breach is possible in part because the Internal Revenue Service relies on Social Security numbers — which it issues and controls — to identify taxpayers. Those same Social Security numbers must be shared with employers, payroll processors, banks and other third parties. This critical key piece of identifying data lives in the databases of dozens of companies unknown to the owner.

A system that operates on a blockchain would, by contrast, use more sophisticated and secure methods for identity, such as tokenized credentials or a self-sovereign identity technology. Using these methods, a blockchain is able to confirm the identity of a participant in a way that doesn't require the participant to show their ID to the entire network. Nor does it require the recipient to keep their own copy. All they need is for the blockchain to confirm that the ID exists.

That same technique could make a range of activities less susceptible to fraud, including insurance claims, credit access and voting. Financial institutions are already leveraging a version of this self-sovereign identity capability to streamline trade finance documentation, “know your customer” accreditation and other costly, redundant and fraud-riddled processes.

Blockchain identity solutions make a range of activities less susceptible to fraud, including insurance claims, credit access and voting.

Why blockchain?

Identity authentication as an enabler of safe trade is just one of the benefits of blockchain. Equally important is blockchain’s ability to enable more diverse transactions — in both type and size — than is possible with traditional centralized systems.

For generations, businesses have relied on centralized infrastructures — such as payment systems, insurance, delivery and logistics services, and governments — to execute commercial transactions and manage risk. But these systems weren’t designed to handle the kinds of

machine-to-machine transactions made possible by digital platforms. This is true both of the volume of total transactions and the size of the individual transactions that are now possible as a result of digital transformation.

Single units of data, cryptocurrency, reward points or pieces of an asset (as opposed to the whole) are a few examples of assets that are or soon will be tradeable over digital networks. The units could be worth less than \$0.01, but they can be traded by the millions or trillions. Current payment systems can’t cost-effectively and securely process transactions below a certain value, and they can’t handle the volume made possible today by the proliferation of mobile devices and networked things.

Businesses need a different way to deal with new digital assets and interactions without involving an intermediary that can collect data on every party in the transaction and take a piece of the value. Enter blockchain.

Blockchain not only makes new markets possible, it can also redirect existing value flows by reducing the control that large multinational corporations, digital platforms, intermediaries and governments have over data.

Blockchain not only makes new markets possible, it can redirect existing value flows by reducing the control that centralized systems have over data.

How blockchain works

Blockchain enables trusted interactions between unknown participants by combining five design elements to authenticate users, validate transactions and record that information to the ledger in a way that can't be corrupted by a single participant or changed after the fact.

The five elements are:



Distribution. Blockchain participants are connected on a distributed network. Participants operate nodes, which are computers that run a program to enforce the business rules of the blockchain. Nodes also keep a full copy of the ledger, which updates independently when new transactions occur.



Encryption. Blockchain uses technologies such as public and private keys to record data securely and semi-anonymously (participants have pseudonyms).



Immutability. Completed transactions are cryptographically signed, time-stamped and sequentially added to the ledger. Records can't be changed unless the participants agree to do so.



Tokenization. Value is exchanged in the form of tokens, which can represent a wide variety of asset types, including monetary assets, units of data or a user's identity. Tokenization, or the creation of tokens, is the way a blockchain represents and enables trade in its native value.



Decentralization. No single entity controls a majority of nodes or dictates the rules. A consensus mechanism verifies and approves transactions — eliminating the need for a central intermediary to govern the network.

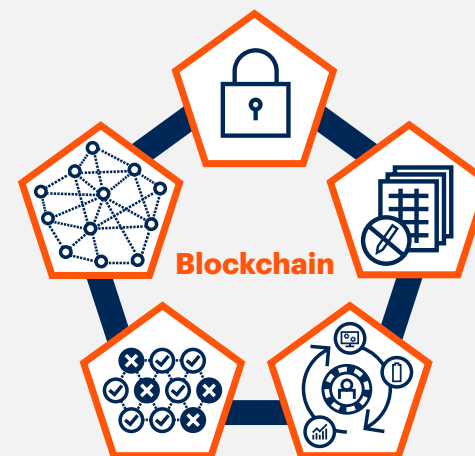
Source: Gartner

The five elements together make a blockchain

All five elements together define and make a blockchain. All five are needed to create new forms of value and safely trade them without centralized oversight.

Blockchain ledgers can't be read, written, deleted or changed as databases can — and they aren't controlled by a central administrator.

It's also important to understand what blockchain isn't. For one, it's not a database — although vendors sometimes falsely describe it as one. Blockchains aren't general stores for information. Blockchain ledgers can't be read, written, deleted or changed as databases can.



Most importantly, blockchains aren't controlled by a central administrator. By definition, the fifth blockchain element of decentralization enables consensus-driven governance. A centralized architecture would leave any solution open to the same issues to which every central system is vulnerable.



The Gartner Blockchain Spectrum

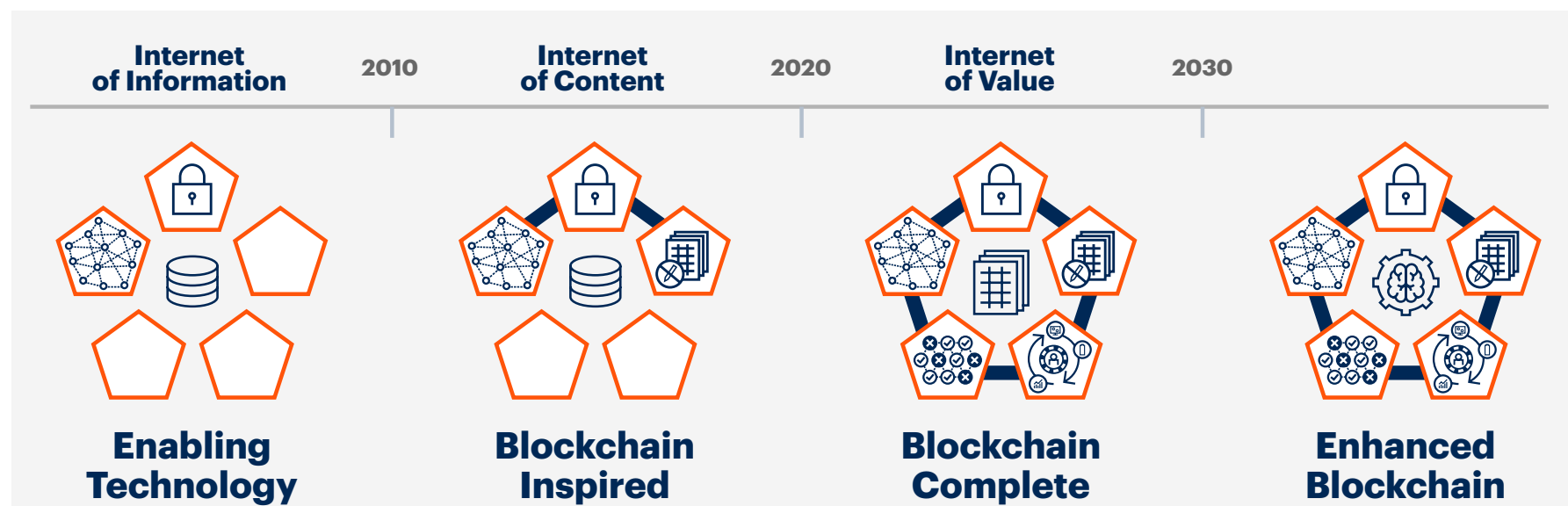
Blockchain is on an evolutionary path

Blockchains require all five elements, though early experiments coming to market incorporate only three of the five. Early adopters are leaving out tokenization and decentralization, as these are the least familiar and mature from an enterprise perspective. Gartner refers to solutions incorporating only some elements as blockchain-inspired solutions.

Blockchain-inspired solutions can still add value by digitalizing manual processes, such as real estate purchases, or by enabling more efficient information exchange in multiparty transactions, such as insurance claims. Without all five elements, however, their value is limited.

Still, blockchain-inspired solutions are useful experiments on the path to solutions with all five elements. In time, blockchain will evolve toward solutions that enable a wide range of new digital transactions.

The Gartner Blockchain Spectrum illustrates the evolutionary path that Gartner sees for blockchain — from the late 2000s, when many of blockchain's enabling technologies reached mainstream awareness, to the current-day blockchain-inspired solutions and blockchains of the future that will operate over networks supported by AI and the IoT.



Blockchain inspired

The Swedish Lantmäteriet's real estate blockchain is one example of a blockchain-inspired solution using only three of the five elements — distribution, encryption and immutability. Tokens are occasionally included in blockchain-inspired solution designs, but in a limited way and under centralized control.

Blockchain-inspired solutions often aim to reengineer existing manual processes specific to an individual organization or industry.

Because blockchain-inspired solutions are developed for use inside an enterprise or between known parties, they are by definition centralized in design. Their owners describe them as “closed,” “private,” “permissioned,” “enterprise” and “proprietary.”

Some blockchain-inspired solutions, like Sweden's Lantmäteriet, have the potential to evolve over time to incorporate tokens and decentralization as design elements. Many enterprises, however, intend their blockchain-inspired solutions to remain under central control. This includes some of the blockchain solutions developed by consortia or third parties for use by multiple members of a value chain. Alibaba, for example, developed a blockchain platform to allow customers to trace the origins of imported foods, such as New Zealand milk products, sourced from third-party suppliers.



Libra coin — the Facebook-led digital currency that is expected to go live in 2020 — is another high-profile example of a blockchain-inspired initiative that plans to evolve over time toward decentralized governance. Libra is a rare example of a blockchain-inspired solution designed with tokens. Facebook has formed a consortium of technology leaders including PayPal, Square, Lyft and others to be part of the Libra nonprofit association that governs the blockchain. The way the consortium describes its blockchain indicates there will be equity among the members. Despite that, both the general market and regulators are discussing Libra as if it were a proprietary Facebook service.

Blockchain complete

Blockchain-complete solutions employ all five elements, including tokens operating in a decentralized environment. They will begin to have market impact in the mid-2020s.

To illustrate their potential, consider the solution evolving at SWARM fund. The nonprofit startup wants to allow individual investors to access investment opportunities that are usually only available to institutions or ultra-high-net-worth individuals. The SWARM fund model allows users to buy SWM tokens, which the organization combines into a pool of capital large enough to purchase an institutional-sized stake in the specified fund or asset class. Though the SWARM nonprofit currently governs the network, the idea is that the network will ultimately operate with a higher degree of decentralization.

As SWARM fund demonstrates, the presence of tokens enables blockchains to create new native digital assets or to represent existing assets in new digital forms so they can be traded. Decentralization drives the use of consensus to authenticate users, assets and transactions, and ensures that no single participant can control the underlying mechanisms of trade or the value produced.



One benefit of blockchain-complete solutions derives from the way they expand commercial participation and access. Anyone or anything can interact or transact in a blockchain-complete network as long as they adhere to the shared rules of the network. In a sense, blockchain-complete solutions are realizing the promise of equal access that was part of the World Wide Web at its inception.

Enhanced blockchain

As blockchain evolves along the spectrum, a number of parallel technology trends are likewise making commercial inroads. Most important among them are the IoT and AI.

Within a few short years, organizations will have embedded billions of devices and sensors in their products and infrastructure. Concurrently, engineers and data scientists are translating decisions into algorithms to execute autonomously. IoT and AI don't need blockchain to develop, of course. Yet blockchain, IoT, and AI complement each other and could provide shared benefits in the form of more reliable data, more secure transactions and auditable AI capabilities.

The result will be an enhanced blockchain in which smart, autonomous things join people as participants capable of identifying, creating, transacting and negotiating for digital assets.

Consider how an enhanced blockchain could function in the context of autonomous vehicles. Within a decade, the intelligent sensors in a car will be able to communicate with sensors located along a driving route to exchange information. Driving conditions, distance traveled and



available parking are examples of the kind of information that can be passed between sensors. An enhanced blockchain network could facilitate commercial interactions using that information. A blockchain could reserve and pay for parking, or draw electricity to charge the car's battery. Further into the future, an enhanced automotive blockchain could coordinate movement of autonomous self-driving vehicles between multiple owners or within a ridesharing network.



The Blockchain Society

Blockchain benefits go beyond business

The benefits of blockchain are not exclusive to business. Just as the internet, mobile technology, social media, AI and big data have individually and collectively driven changes in the way humans, things, businesses and society interact, so too will blockchain. We call the culmination of these technology-driven changes, when governed and enabled by blockchain, the blockchain society.

Consider the issue of identity as an enabler of societal engagement. Identity provides the foundation for participation, as citizens and as economic contributors. Current systems rely on methods such as driver's licenses or passports, which are easy to lose or steal, and can be easily copied by identity thieves.

Long before blockchain, digital identity proponents argued for a digital ID that is portable and secure, and which will allow citizens to access public services, perform civic duties or provide credentials to possible employers. Blockchain solutions provide the added benefit of allowing participants to maintain sovereign control over their personal ID so they can prove who they are without exposing personal data to third parties to use for commercial gain.

Blockchain solves societal challenges

In an early example of a blockchain ID solution with societal benefit, the United Nations World Food Programme ran a pilot in Jordan to allow Syrian refugees to use food credits at local grocers. Inspired by the program, the city of Austin, Texas, later proposed a blockchain ID solution for homeless people to access social services. The same idea of creating a multipurpose digital proof of identity is in testing in various municipalities to enable blockchain-based voting.

Blockchain's impact on the way humans, things, businesses and society interact will rival that of the internet, mobile technology, social media and big data.

Community finance is another area of avid society-driven experimentation. The blockchain startup PotholeCoin, for example, allows motorists to register a needed road repair and put up a token-funded "bounty" to pay for the fix. When enough tokens have been saved, the blockchain deploys a designated repair organization to fix it, and pays when the repair is done. This approach enables local community members to fund repairs that otherwise may not be a priority for their local governments.

Blockchain and the organization

As with societal communities, blockchain's consensus-driven operations will also lead to a reimagining of the traditional organization — and the way in which its members participate. Top-down hierarchy will no longer be the dominant organizational model. Instead, organizations will adopt structures that better reflect the collaborative and collective ethos of blockchain.

Blockchain society offers a wide array of people, businesses and things fair access to resources and fair opportunities to engage.

The London-based startup Colony offers an aspirational example of a blockchain that reimagines the nature of the organization. Using the Colony blockchain, participants can establish their own “colony” (i.e., organization) and define work categories (e.g., finance, marketing) and the tasks that need to be done for each. Participants opt in to become a member of a colony and to complete certain tasks. The more tasks a participant completes at a requisite level of quality, the better their reputation and the more managerial responsibility they can take on. Participants receive fair compensation and promotion based on the quantity and quality of their work.

Returning to the subject of identity, a blockchain-enabled ID can allow participants who gain reputation with one organization to capture a record of their work and share it with others. Such a mechanism could revolutionize how human resources professionals validate employee credentials or recruit talent to participate in high-priority projects.

Society-oriented solutions will help drive citizens toward a blockchain society running on decentralized systems that offers a wide array of people, businesses and things fair access to resources and fair opportunities to engage.

Conclusion

The impulse to wait and see how any new technology evolves is strong. But the rapid adoption of AI algorithms and IoT should make clear that there is no time to wait. These technologies both produce and depend upon massive volumes of our personal and business data to operate. As time passes, our data assets are increasingly under the centralized control of a few powerful actors, who then use it to generate value for themselves at the expense of the larger economy and society.

Business leaders who want a future programmable society in which they can form partnerships and do business with fairness and privacy need to lay the groundwork for a new economic and social model now.

The platform leaders that currently control the lion's share of digital value flows aren't waiting. The financial institutions that manage the flow of money aren't waiting. The largest insurance companies aren't waiting. As a result, no business or societal leader who hopes to influence the terms of engagement for their company or society can afford to wait.

Where to start

To begin to explore what blockchain means for your organization, leaders should:

- **Develop a vision of how blockchains designed with the five elements could benefit your organization today.** What intractable challenges involving access to, exchange of or sovereignty over data could they address? What simple administrative decisions would you leave to an algorithm to make today? How could those initial experiments progress to more complex managerial and leadership decisions? How might you create incentives and reward structures using tokens to encourage participation?
- **Define the organization's blockchain development strategy.** What are the priority use cases? How will you pursue them — independently, as part of a partnership or as part of a consortium? If you're already involved in blockchain pilots, proofs of concept or full implementations, are the solutions inspired? If so, where does the network data reside? Who has access to it? Who defines the rules?

Conclusion (continued)

- **Monitor launches of new blockchain solutions.** Startups are emerging with new blockchain-complete solutions to disrupt incumbent players in various industries. Incumbents are doubling down on centralized solutions while experimenting with decentralized models. And blockchain infrastructure vendors are driving maturity of the technology components. The market is moving fast, and its points of convergence highlight veins of opportunity to mine.
- **Become an advocate for blockchain-enabled IoT and AI transparency.** As IoT and AI continue to gain traction, there is increased backlash by customers and employees concerned about privacy, security and transparency. Commit your business to protecting privacy and pursuing transparency, and leverage the immutability and auditability features of blockchain to show stakeholders that your actions are appropriate.
- **Explore how your organization will evolve its blockchain culture.** When decisions are made automatically and by consensus, it changes how leaders lead and how team members participate. It invites different rewards and incentive mechanisms with an eye to how well they encourage collaboration. Make sure you have multidirectional feedback mechanisms in place to improve outcomes and accountability.

The stakes are high in defining a new economic and social model for the blockchain future. Businesses need a system that can enable trade in the new forms of value made possible by digital advancement, and they need a way to break up the monopoly on data and value currently controlled by a handful of central actors. That is the real business of blockchain available to leaders who are willing to grab it.



A Leader's Guide to Understanding Blockchain and Enabling Digital Business

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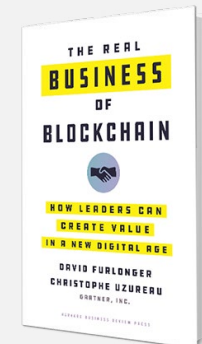
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The Real Business of Blockchain

How Leaders Can Create Value
in a New Digital Age



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