McKinsey&Company

Blockchain explained: What it is and isn't, and why it matters

September 2018

Understanding how blockchain creates business value is essential for companies to identify the right use cases and move beyond small pilots to widespread adoption.

In this episode of the *McKinsey Podcast*, McKinsey partners Brant Carson and Matt Higginson speak with Simon London not only about how companies can drive business value through blockchain—but also how business leaders can determine when blockchain is and *isn't* the right innovation.

Simon London: Hello, and welcome to this edition of the *McKinsey Podcast* with me, Simon London. Today we're going to be talking about blockchain, the technology that underpins Bitcoin and other cryptocurrencies. As we'll hear, blockchain has a lot of potential applications, in areas as diverse as supply-chain management, trade finance, insurance, and even cybersecurity. But there are a lot of misconceptions and often good reasons why a blockchain may not be the right tool for the job. To help us understand the ins and outs, we're joined by two McKinsey partners who are working closely with clients on these issues. They are Brant Carson, who's based in Sydney, and Matt Higginson, who's based in Boston. Brant and Matt, thanks so much for joining.

Brant Carson: You're welcome.

Matt Higginson: You're very welcome. Happy to be here.

Simon London: We should start with a quick level set to make sure everyone—notably me—understands what we're talking about. Matt, would you mind kicking off by answering the beguilingly simple question, what is blockchain?

Matt Higginson: It's a great question. And there have been many complicated explanations out there. The way I think about blockchain is really to think of it as a database. And it's a database which is shared across a number of participants. We think about a network of participants. Each has a computer. The idea is that at any moment in time, simultaneously, each member of that network holds an identical copy of the blockchain database on their computer. That's the essential principle. Information is potentially available to all participants at a moment in time.

When I think about that definition as a database, I think of it in three parts. The first is that this is a cryptographically secure database or distributed ledger. That means that when data is read or written from the database, you need the correct cryptographic keys to do that: a public key, which is a basically the address and the database where information is stored, and a private key, which is your personal key, truly the security which prevents other people from updating the information unless they have that correct key. It's secure data.

Second, it's a digital log or digital database of transactions. Digital's important because, in many industries, we're still going through the process of digitization, and that's an important first step before you can even think about using blockchain.

Finally, this is a database that's shared across either a public or a private network. The most famous public network is probably the Bitcoin blockchain. That is something which has been around for many years. And you can join that network. You can become a node on the network with a computer, without any expressed permissions. And you can leave again. So no one really knows who's joining and leaving.

Conversely, you can have a private blockchain, a private network, which in an application like banking is probably much more culturally acceptable, in which you know who's participating, who's got access to data, who's holding a copy of that database.

Simon London: That was very useful. But as a layperson, I'm thinking, well, we already have big databases. And we already have the cloud, where you can share big databases and manage permissions. So just double click for us, why is blockchain potentially a better mousetrap?

Matt Higginson: This is the core to answering many questions about why blockchain should be used. Four areas of innovation here.

One certainly revolves around the cryptographic keys. The cryptographic security we're using today that was originated in the Bitcoin blockchain truly comes from 20-plus years of cryptographic research. This wasn't just invented overnight. The way of securing data in a distributed database through these keys is pretty unique and certainly uses cutting-edge securities. That's number one.

Second, the idea that this is a distributed, a decentralized, database means that you don't have some of these issues around a database breaking the single point of failure. What you've actually got is a system which is very robust. If one database fails, one copy fails, you've got that important redundancy across multiple nodes.

Third, the essence of blockchain is a chain of blocks of information together. When you have those blocks chained together, you're creating a perfect audit history. You can go back through time and see a former state of the database. If you're recording things like property titles, you can see a previous owner of the property and the current owner. You've got this perfect audit trail.

But perhaps the most important aspect here, and this is what's getting people excited, is this idea of process integrity. And that is the database can only be updated when two things happen. One, the correct credentials are being applied, the private and public key together. But most importantly, those credentials are being verified by a majority of participants in the network. You can only update the database when the majority of independent computers check and verify those credentials that allow you to write to the database. You're securing this against the idea of single point of failure and somebody working nefariously to try and corrupt the database. You have this democratization of the process of dating the database.

Simon London: Brant, let me bring you in there. If you're out at a dinner party, and you mention that you work in blockchain, what kind of responses do you get? And what do you hear are the misconceptions about it?

Brant Carson: There are a lot of misconceptions [Exhibit 1]. A lot of people have heard of blockchain but really don't understand quite what it is. You hear everything, from everybody thinking that blockchain is Bitcoin or vice versa through to "it's a 'truth' machine unto itself."

Exhibit 1

Five common blockchain myths create misconceptions about the advantages and limitations of the technology.

	Myth	Reality	
1	**Blockchain is Bitcoin**	Bitcoin is just one crypto-currency application of blockchain	Blockchain technology can be used and configured for many other applications
2	**Blockchain is better than traditional databases**	Blockchain's advantages come with significant technical trade-offs that mean traditional databases often still perform better	Blockchain is particularly valuable in low-trust environments where participants can't trade directly or lack an intermediary
3	**Blockchain is immutable or tamper-proof**	Blockchain data structure is append only, so data can't be removed	Blockchain could be tampered with if >50% of the network-computing power is controlled and all previous transactions are rewritten—which is largely impractical
4	**Blockchain is 100% secure**	Blockchain uses immutable data structures, such as protected cryptography	Overall blockchain system security depends on the adjacent applications—which have been attacked and breached
5	**Blockchain is a "truth machine"**	Blockchain can verify all transactions and data entirely contained on and native to blockchain (eg, Bitcoin)	Blockchain cannot assess whether an external input is accurate or "truthful"—this applies to all off-chain assets and data digitally represented on blockchain

McKinsey&Company

Is blockchain Bitcoin? No, as Matt was just saying, Bitcoin is an implementation of and leverages a blockchain in order to deliver a virtual currency. We often hear, "Is it better than traditional databases?" No, it's not necessarily better than traditional databases. But blockchain is very effective in an environment where you need to have a decentralized way of working or you're looking to take out a centralized entity—so in things like in trade finances.

That said, I mean, blockchain isn't as efficient as traditional databases. It's much hungrier in terms of energy use and in many cases has higher storage costs. By definition, it's much more for specific use cases.

Is it immutable or tamper-proof? It is only as immutable and tamper-proof as the implementation itself. And, frankly, if you're able to take over half the nodes in a blockchain network, it's very difficult. But if you are, you can tamper with it because then you will be able to affect the consensus algorithm.

As far as it being a truth machine, well, the blockchain's only as good as the information you put in it. So if you have a blockchain, and in the blockchain you're keeping people's driver's license information or voting history, and you put in incorrect data, the data itself isn't checked in any particular way. All that the blockchain itself does is ensure the integrity of the individuals making the transaction, ensuring that you have the right combination of a public and private key.

Matt Higginson: I would just add a couple of thoughts on that. I agree with you entirely, Brant. I think one of the confusions over having a coin like Bitcoin is this idea that there's inherent monetary value.

When we think about the original purpose, it was to reward the computers, the people doing the work, actually doing the verification process. And so a coin was important to provide monetary compensation for, in that case, the electricity being used to do the vast amounts of computation.

When we look to implementations of blockchain going forward, very rarely is it necessary to have a coin or some sort of reward. Instead the reward is access to data. If you think about a private blockchain, a closed-loop network of computers, all pursuing the same eventual goal, let's say it's in insurance or trade finance, then the reward is being part of that club, that private network. And, frankly, the reward is also being better able to share data and therefore generate better business processes.

Simon London: One of the things that strikes me is that a lot of people are drawn to Bitcoin because you're doing away with the central authority, the central banks in that case. Is disintermediation central to how a blockchain creates value?

Brant Carson: Yes, absolutely, disintermediation is one of the ways it creates value, in that you don't have a central authority. It does make things like trade finance much simpler because you don't have intermediaries along the way. There's a very good example: the UN, delivering some of their aid to Syria, has used a blockchain-based solution.

And by doing that, they've been able to actually authenticate individuals using biometric data and use that as a way to ensure that the aid give is given to the right people and it's an equitable quantity.

This is a very clean way of taking out what would be traditionally money that would follow multiple steps and transaction costs to get to the end users. But there are also many other reasons why blockchain is effective. That is only one of multiple different sources of value.

Matt Higginson: I think the principle of disintermediation was a good one, in that the idea of democratization of data, streamlining processes, taking away the central agency power that could actually corrupt how data is being written and recorded permanently. When we looked at the practical applications today, and I'm sure we'll talk more about that, the real irony in some ways is that in order to justify significant investment in this new technology, you actually need somebody to take a leading role very often.

You need someone to stand up and say, "I'm going to be the pioneer. I'm going to develop the platform. And perhaps I'll bring industry partners in. But I'm doing this potentially because the business case says it gives me competitive advantage."

The irony is, in those use cases where that makes more sense, the developers actually tend to be thinking in a more defensive way: "I already hold a central role in whatever ecosystem I'm playing in, and blockchain presents potentially a better solution."

One example would be somebody who's certifying the quality of a supply chain. Organic foods, non-GMO foods. In that case you might think of blockchain as providing the source of truth, the real gold-standard details of a supply chain. But the agencies who are developing it still want to hold that central role as being the authority on saying, "Yeah, this food is organic. And we can track it down the supply chain." It's a little bit of an irony or a contradiction there. Truly, it's about disintermediation, but at the same time, those who are investing in the space think of it as a defensive play to strengthen their position in the center of an ecosystem.

Simon London: So I would guess you're both out talking to clients a lot of the time about whether they should invest and how to invest. What are you hearing in terms of how are they thinking about it? How are they thinking about the value equation?

Matt Higginson: Frankly, it's not all the purist view, which is, blockchain is solving industry problems, and this is the new world. There are three camps or categories of ways that companies are thinking about value.

One is that purist or academic value, which is, there are intrinsic properties of blockchain, which—this goes to the point about being a better mousetrap—really do solve industry problems. They provide a way of sharing data securely across multiple parties. Things like supply chain or trade finance would be absolutely perfect for that camp.

I do think there are a lot of folks who are saying, "Actually, maybe it's not about the technology. But maybe there's something around using blockchain as a banner to modernize an industry,

to move an industry forward—and also to bring that industry closer together, to collaborate, to solve perennial problems—even if the eventual technology solution is not necessarily blockchain the way we think about, but it is much more around digitization and collaboration." I think there are a lot of clients thinking in that space.

Then I think there's, cynically, a third group, who are looking at blockchain purely for its reputational value and saying, "I want to prove to shareholders and the rest of the world how innovative we are. I'm going to start a proof of concept [POC] for things like employee rewards points," a use case that in no way would benefit from blockchain. "We have reward systems that work perfectly well without it. But if I announce I'm doing a POC, I can attract some attention, whether it's from investigators or shareholders or the like."

When we look at the balance between those three, probably that middle group is the one where we're seeing the most traction. We're seeing blockchain as a banner to attract investment, to modernize an industry, agnostic potentially of the end solution, the technology being used.

Brant Carson: I agree with that characterization, Matt. And I think that the most important thing for a company to do or executives to do is to just be quite honest with themselves and practical about which of those three buckets their investment is fitting into. I'm not sure they're quite as clear on where the value is, why precisely they're doing it, because I do think there are lots of folks who are looking for an interesting press release.

Matt Higginson: In the last couple years in certain industries, including the finance industry, there's a little bit of this disillusionment coming through. We've seen lots of investments, to your point, lots of POCs.

Yet I would encourage all players in industries who have been doing POCs to take learnings from those initial pilots. There are many industries that are still very manual based, very paper based. Take transaction banking. The cash-management, trade-finance components are still using technologies that, charitably, are 20 years old. There is momentum here. There is investment here to modernize an industry, even if those early POCs don't appear to have borne fruit yet.

Simon London: Surely another issue is that many of those 20-year-old technologies that you mention support quite profitable lines of business for financial institutions.

Matt Higginson: They do. It's a very fair point. The best example I can think of is cross-border payments. Cross-border payments, again, have been using fairly old technology. Up until very recently, you may have taken three to five business days to complete a cross-border payment transaction in certain corridors. You might have paid 2 percent, 3 percent, up to 10 percent in fees and commissions along the way. And, frankly, in the middle of that transaction, for several days, your money disappears. It literally is invisible. For certain big, international money-transfer organizations, this has been a very profitable revenue stream. These are good margins. And these are margins shared out end-to-end across that payments value chain. The promise

of same-day, seamless, low-cost, cross-border payments—instantaneous payments using blockchain—is one that truly is disruptive.

To be fair to the industry, the major players have looked at this technology, but there's always going to be a bit of a defensive play. Now, what we've actually seen in cross-border payments is that perhaps the dominant messaging player here, SWIFT, has looked at various technologies and has driven modernization using its global payments initiative to improve the customer experience, to get to that same-day experience.

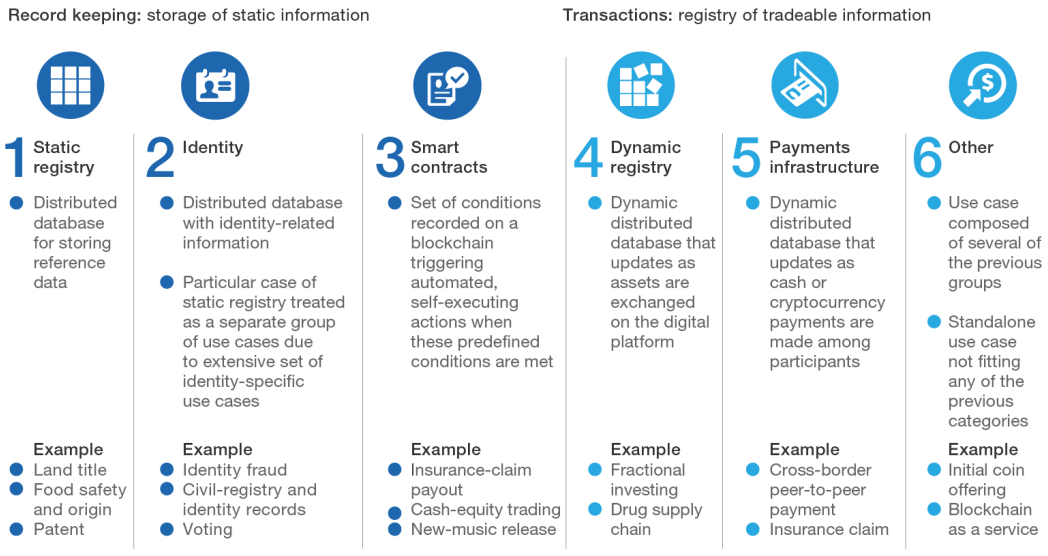
That is forcing the industry to modernize. And, naturally, those margins are coming down. So the evolution of this technology is driving improvements. But, certainly, we are still hearing resistance from certain business-unit leaders, as you'd expect, to this new innovation.

Simon London: Let's talk a little bit more about the potential use cases. How do you categorize them? One of the pieces of terminology I came across is static registry versus dynamic registry. Tell us a little bit more about the use cases and, in particular, about static versus dynamic.

Brant Carson: When we did our research and looked across industries, we found fundamentally six different categories of business applications [Exhibit 2].

Exhibit 2

There are six distinct categories of blockchain use cases addressing two major needs.



McKinsey&Company

The first was the static registry, which is a distributed database for storing reference data, things like land title, food safety and origin, information that we don't expect to change readily. But it gives you a view of the history and also a point of view on ownership.

The second is identity. And this is where we think that, with governments in particular, there are a lot of applications around having just a simple distributed database with identity-related information. And this can be everything from voting records to civil registry and identity records.

The third would be smart contracts, which I personally find quite interesting. A lot of the clients that I serve are putting real energy into this, where smart contracts are a set of conditions triggering automated, self-executing actions.

You could think about things like insurance-claim payouts. Think of having a farmer in a field. They have some IoT [Internet of Things] sensors in the field, and they have an insurance contract that pays out on a monthly basis, depending upon the amount of rain received. Right now in Australia the farmers, in many areas, haven't had enough rain. If they had insurance contracts, these would simply automatically pay out on the basis of the limited amount of rain that we've had in the past month.

Dynamic registry, which you'd mentioned, is simply a database that updates as assets are exchanged. This is the example of things like trade finance. These are things that are much higher throughput. The data isn't very static. It is consistently changing as assets are moving around.

Payments is a clear one. Lots of banks are experimenting with this around dynamic, distributed databases for payments of all types, including cryptocurrency. The sixth is technology itself. Everything from ICOs, or initial coin offerings, through to blockchain as a service, where there are many of the big technology players who are developing that as one of their core offerings as an implementation of blockchain.

Matt Higginson: A couple things I'd like to add. One is that, broadly, I like this idea of the static versus dynamic registry. Static information, truly information that should not be changed, you need a gold-standard copy of that versus a dynamic registry, which is going to record trade information. Things are getting exchanged, people are owning things at different times. That's a great categorization, and that helps us think through those use cases.

The part of this that sticks in my mind, and when we talk to clients that we have a challenge with, is the information that's actually being recorded on the blockchain and who's verifying the information versus the person writing it. Let me give you an example. We talked a little bit about using cryptographic keys to prove your identity, to validate you are who you are and to verify, when you write to the database, that you have the privilege to do that. The blockchain works very well to verify your identity as being the person who has the privilege to write.

What it's not doing is checking the information itself. In Brant's great example of an insurance contract against drought for farmers, you need a gold-standard source of information, in this case an oracle, a national weather service that provides the information. And those cryptographic keys would identify it as national weather-service information. That feels good.

If we think of other applications, things like insurance claims, the challenge there is, it could be the police, it could be a third party, who's providing the information that says an accident has happened. Well, we can verify the who, who's writing the information. What we're going to struggle with is the what. Could it be possible to actually write fraudulent data to blockchain? Of course. You have this off-chain versus on-chain problem, which is, we have no control over the information being written.

We just have the control over the author of that information. That leads, and we'll discuss more about this, but that leads to potential challenges down the line over implementation, which is, maybe this doesn't prevent that sort of fraud.

Simon London: This also true in, say, supply chain, which we mentioned earlier. There's potentially a very rich set of use cases. If you're tracking physical goods through a supply chain, sure you can attach RFID tags to them, for example, but that's off-chain. So I would assume they are as susceptible to tampering as ever they were.

Matt Higginson: That's exactly one of the biggest challenges facing the industry and, frankly, a challenge which has been tackled and hopefully overcome, which is the dematerialization or digitization, the move from physical unique goods to digital unique signatures.

It's one which is typically difficult to overcome. If you're tracking tomatoes through a blockchain, who's to say at some point those tomatoes have not been substituted, unless you can uniquely tag them. There have been efforts by various organizations in the industry to develop so-called ledger or blockchain anchors or anchors that are almost at the molecular level that help you uniquely identify things.

Of course, in the physical world, if we're tracking things like aircraft parts, it's a lot easier to stamp a lump of steel with a unique code that then stays with that item all the way through the supply chain. But when we're talking about perishable goods or synthetic goods or organic things, I think it does become much more difficult. It's a great challenge to the industry, and it's one that's being tackled; we're struggling with this transition between physical and digital.

There's another consideration, too, which is, what does blockchain do to a particular market, when you think about using it to identify physical goods? One of the examples that we've seen in the industry is, can we actually engrave the private cryptographic key onto precious stones? Or you could also use the same way to identify artwork, adding value then to that precious commodity by giving it a unique identifier. That is terrific for our market because you can say, from its source, we can track this over time.

The problem arises when we think about the practicality of implementation, which is, what happens to the rest of the market that doesn't contain this unique identifier? What happens to the precious stones or the artwork that was created prior to the idea of blockchain? There is the potential to bifurcate, and it certainly would depress the value of those precious stones

or artwork and goods that are already in the market. When we think about the applications of blockchain, let's not only think about the technology component and looking forward but also think about the impact on the legacy industry itself.

Simon London: And does this difficult interface between digital and physical explain why there is so much experimentation with blockchain in industry sectors where they're not facing that? Finance is the obvious example. A lot of what's being exchanged is already digital.

Matt Higginson: That is the area where more progress, of course, has been made. Where you already have assets and instruments which are digitally native, then it makes the whole process of adoption easier but also makes much more sense. And we've seen this. We've seen POC in things like exchanging of bonds and equities. It actually gets us over that initial hurdle. We are seeing folks already experimenting with having truly digitally native exchanges, offering certain digital products based upon blockchain. The potential here is that this market will accelerate faster. We're not waiting for this physical-to-digital transition to occur.

Brant Carson: I think though that it's quite interesting, if you look at areas like the public sector. Because in the public sector, in many cases you have relatively static information. You have land-title registry. You have voting records. You have identification. You have travel records, tax records, things that are not actually accumulating that rapidly, but the more that they could be available in a consistent way, it would actually make the operation of government a lot simpler, between departments, if they could be done in a way that people could get comfortable that were quite secure.

In healthcare, again, where a lot of the assets, certainly things like imaging, patient records, they're all electronic. That's another area where there's a lot of opportunity to, again, make these things available, particularly if you go to different hospitals, their information systems don't necessarily easily connect. But if you had a more open blockchain, where you were able to store this information, it would create much easier integration between different hospitals and healthcare systems.

Matt Higginson: Brant, that triggers a thought in my mind, too, which is, again, related to lessons learned over the last few years in this space. And that is, it's very important that when we think about use cases for a particular industry, that we do start with a problem, not with blockchain as a solution.

There was a great excitement because of the association of coin with Bitcoin about the use in payments. But I would argue that if you look at domestic payments systems today in many parts of the world, the friction, the pain, of doing domestic payments has already been taken away. It has already been solved. Things like Venmo and Xoom and various digital money-transfer operation solutions—there are many, many in the marketplace—have already been in existence prior to blockchain and don't rely on blockchain. Equally, even in government, we are seeing a lot of talk about putting citizen data onto a blockchain. But where adoption or where

the implementation is happening fastest is in countries with a very strong central government who, frankly, are able to control the data.

Brant Carson: I think that's a great point, Matt. To build on that further, if you think about the players and who's in the best position to be able to foster or further the adoption of blockchain, they are actually some of the more dominant players. Governments, because they can essentially mandate it or not, are a good example of that.

But, similarly, corporations that are in more highly concentrated industries, where there is much more market dominance, are the ones that are more able to drive the level of standardization required. You can think of things like stock exchanges, where that is much more the case. In places like financial services, where you have lots of banks, what the banks are having to do is, they're having to create consortia as a way to drive consistency of standard because there are so many global banks that no one individual bank can create a standard unto themselves. In terms of where we're going to be able to drive adoption and drive adoption faster, it is in places where there is one or more players who are able to work together to drive a standard, such that the vast majority of transactions can leverage that standard.

Matt Higginson: It's funny, we often get asked, to paraphrase, "What's the right path to adoption?" Easy. You've got to have an authoritarian government, which can drive adoption because that's a good thing for the citizens—or at least the government presents it that way. Or you have a very dominant industry player who essentially has a majority say as to how technology gets adopted. Or—and I think this is the most exciting one—there is a compelling business case to truly modernize an industry. Trade finance is an example. Either one of those three will drive adoption. Without them, I think you're going to struggle to see a use case really get to full adoption.

Simon London: And, again, we go back to this point: the disintermediation of a central authority is not always, or maybe not even in the majority of use cases, what's creating the value.

Matt Higginson: You're right. But I want to make one more comment on that, which is this piece, again, around business case. In our conversations with clients across so many different industries, the biggest hurdle, if you like, within the industry is, "Do we have a compelling business case? Is there financial value? Is there a good return on investment, investing in a technology which is still, to be fair, nascent?"

You may not need disintermediation. You may not even need true democratization of data. But if we're going to invest in this technology and push it forward, it does have to have an imminent return. And in a world in which a shareholder's patience is relatively short, and we often work in 12-, 18-, 24-month time scales, it can be hard to prove that business case. And I think that's been a real struggle in the adoption of blockchain for various use cases and, in some ways, may explain what appears to be a slightly slower adoption curve than perhaps we originally hoped for.

Simon London: When you look at this, Brant, what are the other hurdles to adoption that you see out there?

Brant Carson: There are technical hurdles to be overcome in just how the implementation is done. That is getting increasingly easier as multiple players are creating much more standardized implementation of blockchain. I think that, much like with storing information in the cloud, there's still uncertainty about blockchains. And there's a bit of discomfort from a kind of public population and use of blockchain that has to be overcome, which is always a bit of a hurdle.

Then I think there's a hurdle from a regulatory perspective. As we talked about earlier, you either have to be able to have a regulatory mandate, be a more dominant player, or there has to be a really compelling industry-wide business case. Blockchain is something that certainly benefits quite a bit from either regulatory barriers being raised or taken down.

Simon London: What about resource consumption? You mentioned earlier that blockchain can be quite computationally intensive. And it can also be quite energy intensive because you have all these nodes on the network replicating the ledger and doing the cryptographic handshakes and so on. Is this something that's endemic to blockchain? Or is it really a function of the design choices that you make?

Matt Higginson: There is no doubt that having multiple copies of anything is inefficient. I think it is worth drawing this contrast that Bitcoin was set up to be energy intensive as a hurdle to entry. The amount of computation you need to do was set to be high, truly as a barrier to entry, to manage the number of nodes that are doing the computing work.

One other consideration that's important here though is that almost aside from the inefficiency, there are also limitations under today's implementations about the amount of data that can be stored. Brant, your great example of looking at healthcare records. There is no implementation today that would say you'd put the actual healthcare records themselves onto a distributed ledger. Instead you use it as an index, as metadata for locating your own healthcare records.

So on today's implementations, there are still many limitations. Are we seeing evolutions? Absolutely. And I would argue that the blockchain protocols that we are seeing and reading about today almost certainly are not going to be the ones we're going to talk about in two or three years' time. This is a technology which is evolving rapidly. And, in fact, many flavors of these protocols are evolving specifically for specific purposes.

Brant Carson: Matt, your answer, I think, was excellent. Because it is true that the Bitcoin implementation of blockchain was very much intended to use as much energy because it was supposed to be a barrier to entry. And there are many different implementations being created and also different consensus algorithms that are being experimented with in order to "solve" the hurdle of energy usage as well as transaction time to reduce the amount of time to complete a transaction. Because right now to complete a Bitcoin transaction, most people

don't realize, it actually takes minutes to complete a Bitcoin transaction, where a transaction on a typical database takes fractions of a second.

Simon London: Well, I'm afraid that's all we have time for today. But thank you very much, Matt Higginson in Boston and Brant Carson in Sydney, for a fascinating discussion.

Brant Carson: You're more than welcome.

Matt Higginson: My pleasure.

Simon London: And thanks as always to you, our listeners, for tuning in. To learn more about our work on blockchain, disruptive technologies, data analytics, and more, please visit us as McKinsey.com. ◻

Brant Carson is a partner in McKinsey's Sydney office, and **Matt Higginson** is a partner in the Boston office. **Simon London** is a member of McKinsey Publishing and is based in the Silicon Valley office.