Principles of Successful Blockchain Deployments

Includes bonus chapter on the future of blockchain

Web3 Labs

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Introduction

The pervasiveness of blockchain technology continues to make greater inroads in our society. Now as 2020 comes to a close after a somewhat turbulent year, it continues to edge its way further into everyday life.

The opportunity that blockchain presents for businesses continues to go from strength to strength spanning dozens of industries. Global spending on blockchain solutions reached USD 2.7 billion in 2019, and is projected to reach USD 4.1 billion in 2020 year in spite of the pandemic, while some forecasts go as far as to suggest it may get to almost USD 18 billion by 2024.

With that in mind, executives and managers are increasingly aware of the transformative potential of the technology, with a significant number of the world's largest companies embracing the technology. From the supply chain industry to finance, blockchain is already carving out its place in the world.

The creation of this book was born from the fact that when organizations start looking at blockchain as a technology to trial or adopt for their business, there is a whole host of different decisions that need to be made along the way. All of these decisions take time and money to make, and many of them we see repeated from one organization to another.

Hence, by sharing some of our wisdom in these pages and providing some guiding principles here, you will be able realise actual cost savings by not reinventing the wheel and ensuring that you position yourself for success.

The following sections will help ensure you:

1. Select the right problem to solve
2. Select the appropriate technology platform
3. Select the appropriate people to do the work

The work here is supported by a number of examples of businesses who have already successfully adopted blockchain technology within their organization and relevant industry reports where applicable.

In putting together the research for this book there was no shortage of relevant case studies and reports to support it, and we hope that by reading it, you will find as much inspiration as we did for finding opportunities for the technology to provide impact.

Conor Svensson
Founder and CEO of Web3 Labs

Chapter 1
The Principles of Successful Blockchain Deployments

Executives and managers are increasingly aware of the transformative potential of blockchain technology, with a significant number of the worlds largest companies embracing the technology. Prospective users, however, will first have to overcome a few common obstacles. At Web3 Labs we've identified three common principles that help address these.

What's Holding You Back?

Although the answer to this question is largely subjective, there are some common concerns among prospective blockchain users that should be addressed. Here are some of them:

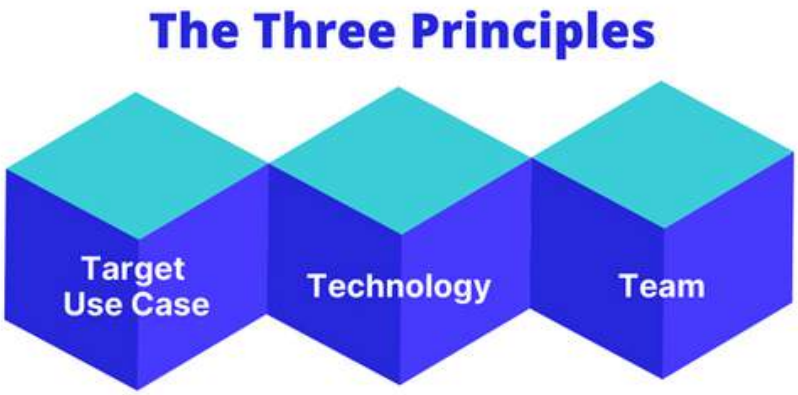
- **Selecting the wrong problem:** even though blockchain can be used to solve many problems in a wide range of different industries, it is still not a panacea. Understanding what it can actually do and where its strengths best come to light is key to putting it to good use.

- **Unattainable expertise:** while blockchain is different from other, more established technologies, that does not mean the niche is closed to all but a select few. However, when businesses showed the need for blockchain, developers rushed in to fill it, so now there are plenty of solutions within the space to choose from—all prospective users have to do is figure out what it is that they need.

- **A lack of adoption:** there is a perceived lack of adoption with blockchain, but we would argue the annual Blockchain 50 reports from Forbes, shows otherwise. A number of the world's largest corporations have already implemented the technology in one way or another. On the other hand, the decentralized finance (DeFi) space attracts institutional and retail investors alike, with more than USD 12 billion locked in the space as of the time of writing (source: defipulse.com).

These worries are reasonable, but largely unfounded, aside from the first. It's not an uncommon issue—trying to force blockchain to solve just any problem is counterproductive. The correct use case selection is part of our three principles, which we cover below.

The Three Principles Overview



1.Target use case

What problem are you targeting? Although blockchain can be applied to many different use cases, there are a number of them that would benefit more from a different solution—using blockchain just because it's the shiny tool is pointless. However, there are three main areas in which blockchain excels that we will discuss in more detail in the following chapters:

- **Records of ownership**
- **Cross party business processes**
- **Digital fingerprints**

2. Technology

Blockchain's first foray into mainstream was through the popularity of Bitcoin. Ethereum then introduced programmability into blockchain networks with its virtual machine. This grew the opportunities beyond simple use cases like virtual currencies, into those we touched on above.

Finding the platform to support your business depends, first of all, on whether you want a public or a private network.

Public networks include the likes of Bitcoin, Ethereum, Polkadot, Cardano, and others. Private networks are consortia-driven, support greater transaction throughput, and are permissioned—in other words, aimed at businesses who need blockchain without the decentralization aspect usually associated with it.

Within the private network sphere, there are several well-established platforms users can choose from which we explore further in the 'How to choose the right Blockchain Technology' chapter.

3. Team

One of the other important considerations when deploying blockchain is the level of expertise you have in your organisation to support the deployment of the platform you have chosen. Broadly speaking there are three options, ranked by complexity, from highest to lowest:

- **Self hosted.** As its name implies, this means onboarding a DevOps team to create a fully bespoke blockchain platform from the ground up.
- **Cloud.** Blockchain-as-a-Service offers third-party creation and management of blockchain networks, but still requires some understanding of how the technology works for day-to-day operations.
- **Fully managed.** Some providers are able to create your solution for you, as well as manage it completely.

One you have your platform deployed, smart contract development is another important consideration: which programming language do you want to use? Different providers will offer support for different languages. There is also the matter of integrations, as finding the way in which blockchain fits in with your existing infrastructure is key to successful implementation.

Finding the pain points of your business and seeing how blockchain can solve them is actually a pretty straightforward task when you're clear about what the technology does well—as our first principle highlights. From there, following the other two principles will have you well on your way to a successful blockchain deployment!

Chapter 2
How Blockchain Can Simplify Your Business

Blockchain adoption across the board is showing no sign of slowing down. A PwC survey from 2018 showed that 84% of their respondents, which included 600 executives from 15 territories, were already actively involved with blockchain. That number has since grown, and the survey adds that 10% to 20% of global economic infrastructure will be using the technology by 2030.

Most people looking to start using blockchain don't know what problem the technology actually solves. Once prospective users realize what blockchain's use cases are, they can see whether it can be applied to any of the issues they're already facing within their business.

The Three Use Cases

Although blockchain can theoretically be applied to a wide range of issues, there are three use cases in which it excels:

- **Records of ownership** let all participants with access to an asset clearly see who it belongs to, without the need to update internal systems. This reduces redundancy, removes any third-party costs, and increases transparency. Keeping an asset unconfined to a single entity or organization, yet no less secure, means that every process relating to the asset is vastly simplified.

- **Cross party business processes** allow businesses that oversee multiple entities to keep them all synchronized more quickly and efficiently. Again, third party solutions can be minimized or even eliminated, while offering a tamper-proof record of events, useful for our next use case.

- **Digital fingerprints** in blockchain mean that every recording is tamper-proof and transparent, which can be useful for dispute resolution. In many cases, knowing that there is an irrefutable source of proof is enough to dissuade most malicious actors from even attempting to cheat. Even if it doesn't, the whole process of verifying information is almost eliminated thanks to blockchain's trustless design.

The three categories tie into each other, as they all derive from blockchain's basic properties: transparency, immutability, and security. You don't have to face all three problems at once, but you can keep in mind that blockchain can fit the bill of more than one issue you're having.

Where to Start

The first step is always identifying the pain points of your business. When coming up with potential solutions, you should then check to see if they fall into any of the aforementioned use case buckets (or a combination of them, as many are interconnected).

Your pain point examination can include the following questions:

Would we benefit from records of ownership? Do you deal in assets that need to be clearly and transparently labelled in order to be shared? This is the case with Central Bank Digital Currencies (CBDCs): they use a blockchain-based token to represent a fiat currency, regulated by the country's monetary authority, and distinguishable to prevent imitation (in the same way that paper money needs to have a unique serial number). While no bank has yet officially launched a CBDC, many banks have pilot programs already running. This includes the central banks in England, China, Russia, Venezuela, Sweden, Thailand, and more.

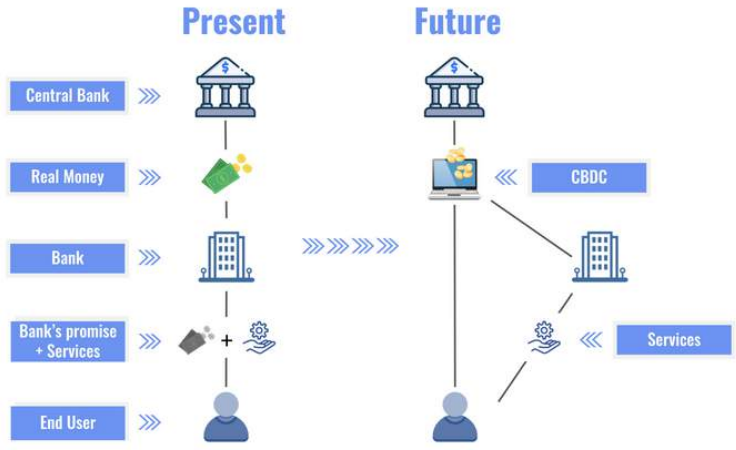


Image Credit (https://daml.com/daml-driven/what-is-a-central-bank-digital-currency-and-why-should-people-prefer-cbdc-over-bank-accounts/)

What is our current reconciliation procedure for different entities within the business? Could we benefit from removing intermediaries and speeding the process up? These are everyday issues for many businesses handling and coordinating subsidiaries, multiple locations, etc. Many of them are already overspending on third-party services and would like to be able to bypass them altogether. For example, Xbox game publishers are receiving their royalties nearly instantaneously thanks to the Microsoft Azure Blockchain Service—a process which used to last 45 days before this innovation. This also offers real-time insight into customer demographics and campaign success, helping publishers adapt their approach accordingly.

Do we need better insight into events that happened and the accuracy of the information? Would our customers benefit from authenticity guarantees? Businesses that claim integrity as one of their key properties can take this a step further by introducing blockchain into their model. The permanent record of truth can also be used in dispute resolution, like insurance claims. With the importance of ethically sourced materials, blockchain's proof of origin can be of immense help. As an example, in 2018, the world's leading diamond company, De Beers Group, announced they had tracked 100 high-value diamonds along the value chain during the pilot of its blockchain platform—from mining to retail.

Common Objections (and Their Counterarguments)

Some arguments concerning blockchain crop up relatively often when the technology is mentioned, including:

- **Isn't it just a slow/complex database?** In short, no. Blockchain can do things beyond the scope of a simple database, including (but not limited to) spanning the boundaries of several organizations, while remaining safe from malicious tampering from any of them. Media reports usually revolve around bottlenecks in public blockchains during periods of high transaction volumes. Important to remember, however, is that these are public, while many businesses who opt for blockchain will choose a permissioned variant. This way, they do not depend on the events in the rest of the network, plus they can always adapt it to their specific needs.

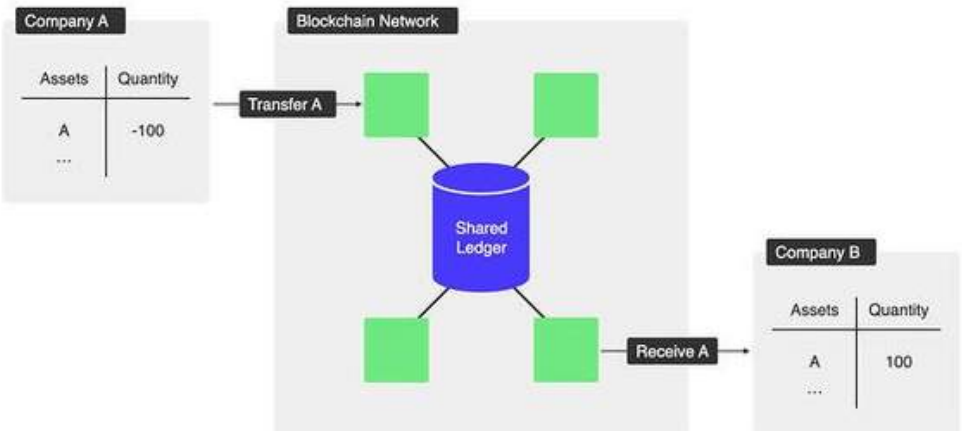
- **It's really complex!** Strictly speaking, it is—but so are most technologies. When you select the right type of blockchain solution for your use case, along with the right team to handle it for you, that complexity is significantly reduced. Using it in its completed form is no more difficult than adapting to any other newly introduced technology in the workplace.

These, as well as a number of other common concerns, are non-issues as soon as people understand what blockchain does. While it's not a panacea, it is exceptionally well-suited to the use cases already listed, and is widely and successfully used to help with those problems.

Chapter 3
Why Blockchain is Great for Records of Ownership

One of blockchain's most significant use cases is in simplifying records of ownership or "tokenization" of assets. This stems from blockchain being tamper-evident: a single change to previously recorded data, no matter how small or in which part of the blockchain, alters all subsequent data on the chain. In other words, while information can be updated, something that was once recorded can never be changed or erased.

Any given business deals with a multitude of other businesses or suppliers on a daily basis, and they need to be able to trust the data they receive from them. Usually, they would update their internal records with new information. That way, all participants have their own databases and do not rely on unchecked information from each other. However, the structure of blockchain removes that redundancy by offering a transparent and tamper-proof environment for everyone.



This approach also simplifies the process of transferring ownership of both digital and physical assets between two entities, where both have access to the same blockchain. Instead of having to update an internal record, both parties agree on updating having a common representation of that asset on the blockchain, saving time and effort in the process. The format of this asset can often be represented as a token.

Another significant obstacle in records of ownership is the problem of finding a standardized format for digital assets that allows them to be transferred between entities. Companies may choose to use different formats, making switching to another one a costly and time-consuming process, along with posing the question of which company should be the one to make the switch. With blockchain, all participants use the same format as it exists as common code on the blockchain which they can all interact with (of course with a degree of permissioning), which differs from other non-distributed or shared solutions.

What Users Can Do

As blockchain lets you establish any asset in a digital form and record ownership, the first step for those looking to implement the technology should be in seeing which of their existing assets would benefit from such an approach. This can be something that already exists, either physically or in a digital sense, that could use a blockchain representation.

One such example is in the ESG (Environment, Sustainability and Corporate Governance) sector with emissions offsets. A company wanting to offset their carbon footprint will calculate their emissions and then purchase credits from companies that prevent or remove emissions for an equivalent amount in an effort to stay green.

Companies working on the latter can be planting trees or introducing clean energy technologies into developing countries, which can be easily represented on the blockchain and sold as necessary. ClimateTrade is doing exactly that: letting companies select among their projects to achieve carbon neutrality, they're using blockchain to introduce much-needed transparency to the space.

Another question to ask is whether such an asset would be useful to your customers or suppliers. One such example is in the trading of commodities. Since there are so many participants in the creation of a commodity, the transfer of ownership requires a significant paper trail. By moving it to the blockchain, not only is the paper trail minimized, but the buyer can also check the authenticity of the asset through the data on the chain.

Vakt, which started operations in 2018, is aiming to modernize physical energy commodities trading by adding blockchain into the mix. This will let it handle these commodities every step of the way, removing the need for paper contracts they call "cumbersome." Vakt has now signed up two-thirds of the companies responsible for deals in North Sea crude grades. It is now preparing to expand into new markets and commodities.

The supply chain industry is another large industry where blockchain is leaving its mark. An added benefit of this approach is that this also creates a seal of authenticity that can be visible to your end customer if you so prefer, as a mark of quality. As there are raw materials that are often acquired in controversial ways, from coffee beans to cobalt mines that utilize child labor, blockchain tracks every step of the way and can help uproot these practices.

Starbucks, for example, has introduced a blockchain that registers the details of coffee beans from the moment they're grown until they end up in a customer's cup, so the consumers can know exactly where the beans are from.

Perhaps the most significant use case for a wide audience is the creation of central bank digital currencies (CBDCs). Although there are currently none live, many central banks are working on adding the digital aspect to their fiat currencies through implementing blockchain, as this technology is the first one to fulfill their rigorous safety standards. Sweden is among the lowest cash-usage countries in the world, and their pilot project for the e-krona is running between February 2020 and February 2021, started by the Swedish Riksbank in partnership with Accenture. Additionally the Bank of England recently published a report detailing the key requirements for CBDCs.

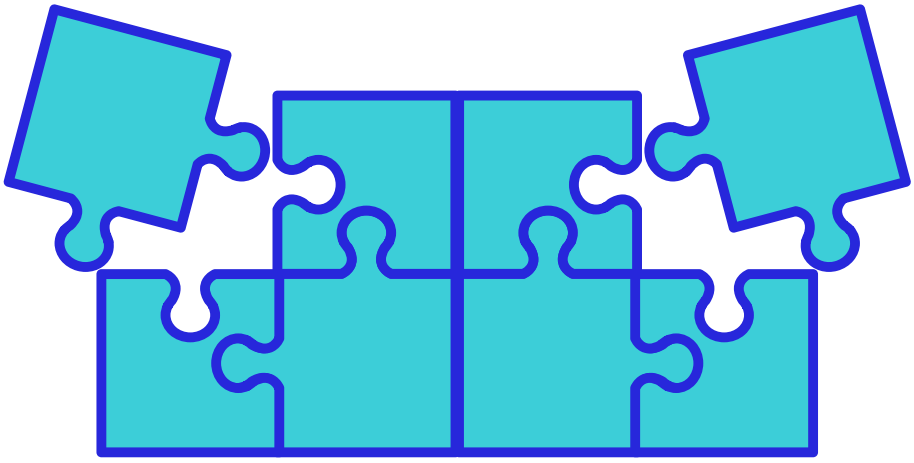
Common Arguments Against

Prospective blockchain users often cite a few main reasons why they're wary of using the technology:

- **High complexity:** blockchain is admittedly complex—but choosing the right team, platform, and use case can reduce this, if not completely eliminate that complexity. This is not too different from any other conventional technology: yes, setting up electricity in a new home is extremely complicated and should only be attempted by professionals, but in the end, you won't be seeing the wires—you'll be turning on the light or using the oven.

- **Can't these assets be stolen by hackers?** Realistically speaking, anything can be the target of malicious actors. This is why we recommend starting with a private, permissioned blockchain backed by a consortium. Not only does this add another layer of security to an already secure technology, but the tokens themselves will be worthless outside of the consortium, which you have the controlling stake in. But, as we've already established, data residing on the blockchain cannot be changed, and new additions to the chain are visible to everyone (unless privacy techniques are used), which ensures transparency of asset ownership among participants.

What other industries would benefit from blockchain as a solution for records of ownership? We've only scratched the surface here and have plenty of other examples we could discuss.



Chapter 4
How Blockchain Simplifies Complex Business Processes

One of the things blockchain is great at is in simplifying complex business processes. This may sound slightly counter-intuitive given the perceived barriers to entry for using this nascent technology, but keep reading and you'll see why.

Many large companies deal with a multitude of suppliers and other businesses in their day to day operations. If they are of sufficient size, they may even deal with multiple other entities which are all part of the same company. These dealings supporting their core businesses creates a web of connections that require a lot of communications back and forth between these different entities or suppliers. The complex, or cross-party process can be made significantly easier and faster through the use of an equally accessible, safe, transparent, and tamper-proof technology like blockchain.

Characteristics

- Complex business processes with multiple external entities
- Trusted intermediary sitting between transactions

Sample use cases

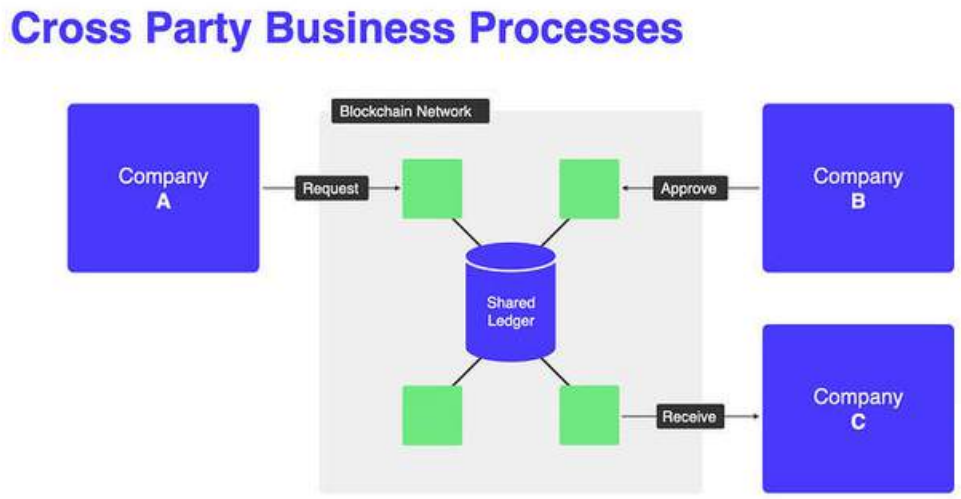
- **Supply chain**
  - Digital bill of lading
  - Supply chain transparency
- **Finance**
  - Insurance claim management
  - Financial reporting and reconciling

A common, but complex business process is a transfer of ownership via a sale: by default, this requires an intermediary to act as the trusted mediator between both sides - the buyer and seller and handle the actual transfer of ownership of the asset and the processing of the funds to pay for the goods. Due to the intermediary sitting in the middle of the transaction, the transfer becomes more complex, as both the seller and the buyer of the asset being transferred need to update their own internal systems at each stage of the sale and subsequent transfer based on the interactions with the intermediary.

This may seem like the logical way of doing business—but blockchain removes the need for this additional complex and potentially costly process by providing a single, immutable source of truth for all parties. This can significantly simplify these processes, and save businesses a lot of money in the long run.

To provide a trivialised example - its like purchasing a house and no longer needing a solicitor to handle the transfer of funds and title deeds of the property!

A Better Approach



Using a shared ledger on a blockchain can reduce or even eliminate the reliance of intermediaries, which tend to be costly and time-consuming. However, shared ledgers introduce a whole host of other concerns, mostly revolving around security and transparency. Blockchain is tamper-proof, which means that changing any recorded data corrupts the chain as a whole and renders it unusable—but even getting to that point would imply reversing complex cryptographic processes designed with the utmost security in mind. Blockchain is also fully transparent (within a private, permissioned network this only includes the participants), so it can be considered a neutral playing ground for everyone involved.

A specific field in which this implementation of blockchain has seen a lot of success is the supply chain industry. When shipping goods from one place to another, a number of different companies will be interested in at least a few stages of the journey. From a product's on-loading to its arrival, each part of the process can be recorded on the blockchain, instead of having to coordinate between several participants and exchange information between one another.

One such example is Komgo: a blockchain-based commodity trade network. The blockchain-based ledger allows Komgo stakeholders to digitally attach verifications of cargo shipments to specific letters of credits, which reduces the susceptibility of fraud while banks temporarily own a commodity shipment. In the year since its public launch, Komgo supports close to $1bn USD of financing which has been channeled by network members.

Insurance is another field in which blockchain can help streamline existing processes. With several participants, from the insurance company, to the underwriter, to the insurance buyer, everyone needs access to the same information. With a single source of truth for everyone reduces friction in the environment by simplifying data reconciliation and improving accuracy. Additionally, all of this leads to significant cost reductions in the long run. The Accenture Technology Vision 2019 survey shows that 80% of the surveyed insurance companies claimed they had either adopted or were planning on adopting blockchain technology.

Anthem is the second largest US healthcare insurance company. In December 2019, they announced a pilot blockchain project that would secure medical data of their 40 million members. Users will be able to scan a QR code through an app and grant access to their records to healthcare providers for a limited amount of time in order to still keep those records private, but also to withdraw that permission as soon as the appointment is over and protect their data. Anthem has added that they plan to use blockchain in around a dozen ways, around 40% of which are already live.

Wakam is an insurance provider, formerly known as La Parisienne, with a long and rich history—established in 1829, they insured France's first horse-drawn carriages. Now, they're using blockchain to reverse the usual model: instead of the client having to provide the proof of damage, now the insurer does this, along with automating the claims process.

Removing intermediaries, but also costly and time-consuming processes has already proven itself useful in the gaming industry—or at least one part of it: Xbox game publishers, who had to wait 45 days for their royalties before, are being paid out in mere minutes. Introducing blockchain now means that accounting does not have to rely on reconciliation caused by using different books and offline ledgers.The publishers are seeing other perks as well: now they can get customer demographics data almost instantaneously, allowing them to tailor their campaigns as needed.

Potential Counterarguments

In every conversation about blockchain and its advantages, some common arguments tend to crop up and need to be addressed:

- **Blockchain is too complex and/or getting started is too hard.** While blockchain is certainly complex, choosing the right team, technology, and use case can reduce this complexity or even eliminate it completely. Just like you don't have to think about the technicalities of programming an app when you hire a team to create one for your business, you won't be seeing the complexity of blockchain at the surface level, where it will be used.

- **Reconciliations are a fact of life.** Strictly speaking, this is true right now, but this is absolutely no reason why things should stay that way. Improving and simplifying business processes, even those that seem unchangeable and unavoidable, can both spare you many a headache and improve your quality of life in the long run. With the right mindset, upgrades can be a fact of life, too.

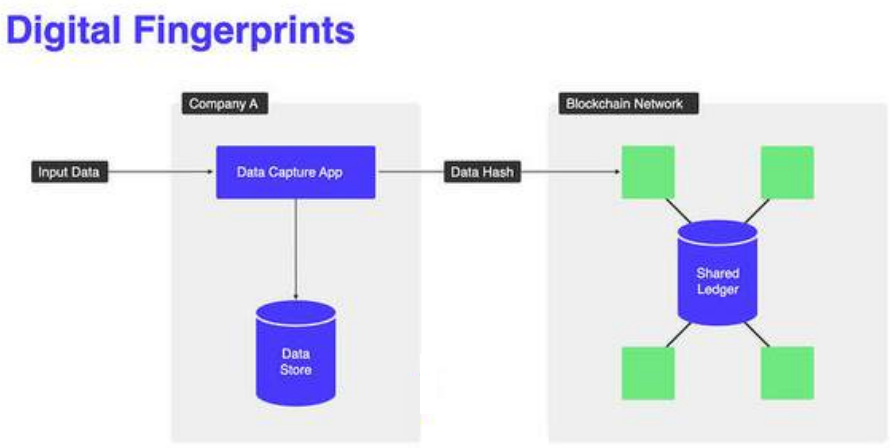
The use cases we've mentioned are only some examples of places where blockchain is already leaving its mark. There are innumerable other areas with high potential for long-term growth.

Chapter 5
Why You Should Use Blockchain for Digital Fingerprints

Blockchain excels at proving an event took place. When new data is written to the blockchain, it is inextricably linked to every other record—changing even the smallest detail would change the structure of subsequent data written after it. In other words, blockchain is perfectly suited to tasks such as conflict resolution and guarantees of authenticity.

With more traditional mainstream technologies for data storage and capture, one of the biggest issues is that external parties cannot vouch for the accuracy of the data they're being presented with. As it could have been tampered with in some way, this necessitates deeper audits and manual verifications against other records, equally subject to manipulation. There are simply no easy ways to resolve disputes revolving around whether or not something happened: each party, driven by their own interests, will have their own views.

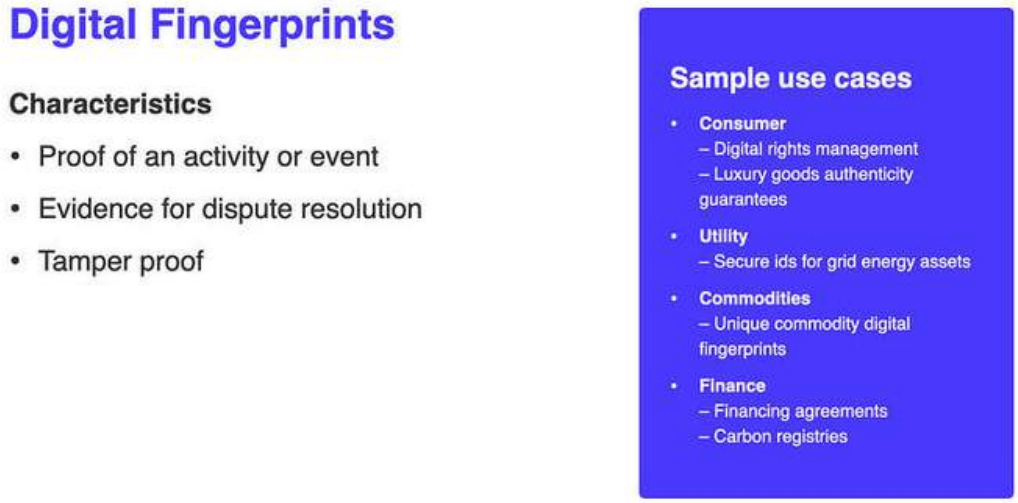
How Blockchain Helps



As we've mentioned above, blockchain is tamper-proof—changing anything changes everything. As blockchain is also transparent, alterations to data become visible to everyone with access to it.

Therefore, as soon as an event takes place, a digital fingerprint of that event can be recorded within the blockchain for future reference. With this security and transparency, it becomes a single source of truth for everyone involved, significantly cutting down on the time and costs involved with auditing, verification, and keeping multiple records.

There are numerous real-world use cases involving digital fingerprints in which blockchain excels. One of them is digital rights management: blockchain can protect the copyright of digital content, as well as provide tracing tools in the case of violations. Additionally, the technology can also work as a system for recording any ownership changes and other relevant data, as we've covered in the chapter on Records of Ownership.



Japanese electronics giant Sony has announced that they were leveraging the technology to help manage copyright-related information. Users of any recorded content will be able to see the author's information, as well as the time and date of the creation. They've also stated that educational content is a prime use case, as the area could benefit from increased transparency and efficiency.

Providing authenticity guarantees for luxury goods is another sphere brimming with potential. With the number of imitations and counterfeit goods, some of which can even pass for the real thing unless the buyer is very experienced, having irrefutable proof that the commodity was farmed, mined, or produced according to standards can be of significant help. Additionally, making such records generally available would go a long way towards cutting out counterfeits completely, as they cannot provide such authenticity records.

Diamonds are a commodity that can greatly benefit from improved supply chain transparency (another major blockchain use case that we've covered in Complex Business Processes), but also from proving they were ethically sourced. In this industry, transparency is quickly becoming a must instead of an optional feature. Everledger provides a platform for diamond tracking, which has been used by US-based retailer Fred Meyer Jewelers to show the journey of the pieces in the RockSolid collection that later became available in 100 stores in the United States.

In the Records of Ownership chapter, we mentioned emissions offsets, as they benefit from being able to track ownership from creator to buyer. They can also incorporate digital fingerprints by letting the company buying carbon emissions offsets have full traceability of where the offsets were first created, again providing a seal of authenticity to potential buyers.

FlexiDAO is a blockchain-based platform that lets energy retailers sell cleaner and cheaper electricity, providing them with certificates of origin, smart consumption based on market prices, and grid balancing services. This also lets customers track their green energy in real time, leading to vastly improved transparency in the field.

They're far from the only participant in this field: professional services firm KPMG is working on a blockchain solution called Climate Accounting Infrastructure (CAI) that will let companies tackle their greenhouse gas emissions by measuring and reporting them, but also offsetting according to collected data. The solution will combine a blockchain platform provided by Allinfra, and a combination of artificial intelligence, machine learning, and Internet of Things (IoT) sensors provided by Prescriptive Data, a company supporting verifiable emissions data with their intelligent building software.

Common Objections

Even with the advantages we've listed, the idea of using blockchain can also bring some concerns to the minds of prospective users.

- **How can anyone be sure the data was not tampered with?** When a new record is added to the blockchain, a hash or digital fingerprint is created. This hash relies on all the information that was already stored there. If any of the information is changed, the hash breaks down and makes everything else unusable as well. When the underlying data is retrieved, it can be simply verified against the stored digital fingerprint.

- **We already have digital fingerprints/hashes to verify the authenticity of key activities.** That's a great start! However, unless those digital fingerprints are on the blockchain, an external organization has no proof that the digital fingerprints haven't been modified to match the data being presented.

In short, using blockchain to store digital fingerprints of an event that took place provides a source of truth that cannot be tampered with. This can cut down on the time needed to audit and verify the data being presented, as well as the costs associated with this (especially if they usually require a third party).

Chapter 6
How To Choose The Right Blockchain Development Team

A major consideration for successfully deploying a blockchain application is in selecting the right team for the work. The required skill set goes beyond simply deploying the underlying platform and development of the actual blockchain applications - it will need to be properly managed, integrate with your existing technology platforms, and address a number of information security considerations.

There are three key aspects within this topic that a prospective user should consider, which we will expand upon below.

Platform Deployment

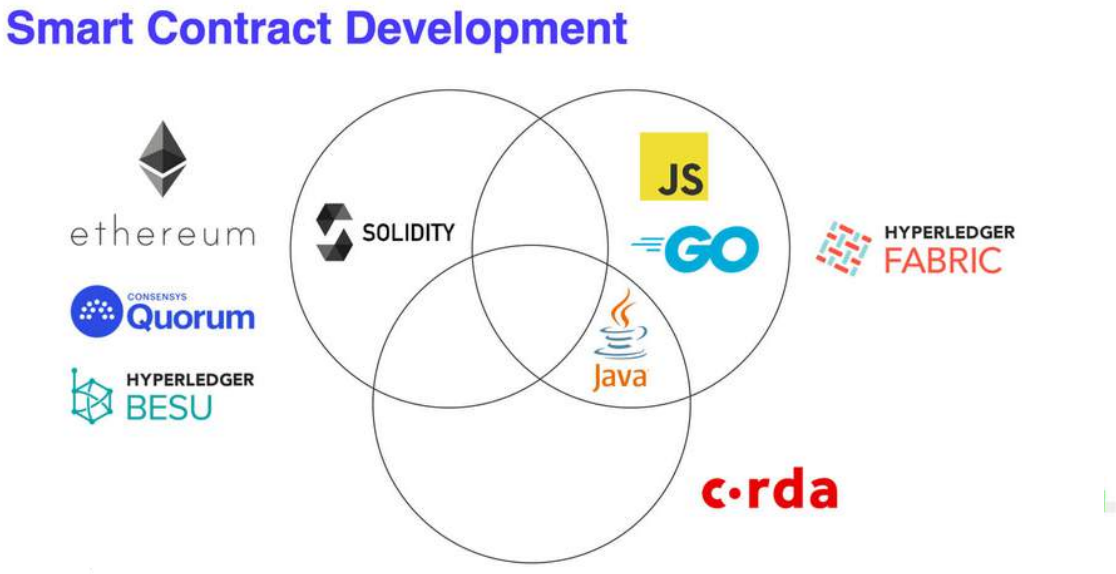
The first consideration is where you will be hosting your platform. Building a blockchain solution is far from a simple, straightforward task. Depending on the resources you have a available, you have a number of different options here:

- **Hosting the infrastructure yourself** requires significant dedicated DevOps resources, as blockchains take a lot of setting up to get right. On the other hand, this does allow for more choice, meaning you can tailor the blockchain completely to your own specific needs—if you have the time and resources to dedicate to this.

- **Cloud based Blockchain-as-a-Service (BaaS) solutions,** are solutions in which a third party creates and manages a blockchain solution for you. However, you will still need some in-house expertise for the best results. Both Microsoft Azure and Amazon Web Services have BaaS offerings.

- **Fully managed services are the lowest complexity tier:** not only do they build up the whole infrastructure for you, they also manage every aspect of it for you. This goes a long way in reducing blockchain's inherent complexity, although it still has some challenges compared to other technologies. Two key providers in this regard are Kaleido and Chainstack.

Development



Having just the underlying blockchain platform is not enough; you will also need code that runs on the blockchain. This code is typically referred to as smart contracts or Decentralized Apps (DApps).

The three dominant platforms here are Ethereum (along with its variants, ConsenSys Quorum, and Hyperledger Besu), Hyperledger Fabric by IBM, and Corda by R3. Ethereum uses its own programming language, Solidity, for creating and running smart contracts, while Hyperledger Fabric provides support for JavaScript, Golang, and Java. Corda, on the other hand, only supports Java at present.

The creation of smart contracts can be quite labour intensive from a development perspective. It requires both time and expertise to get right—however, thanks to the popularity of the three aforementioned platforms, there are plenty of freely available example applications for them supported by a number of experienced programmers within these communities. This is especially true in the Ethereum community, which has drawn a huge number of enthusiasts with a thorough understanding of the technology and its inner workings.

Finally, no blockchain platform is self-sufficient; you will need to handle integrations with your existing technology stack as well. As we've mentioned, Hyperledger Fabric has native libraries for Java, Golang, and JavaScript, while Corda is restricted to Java. Ethereum, however, supports a far wider range of technologies, again thanks to its vibrant community —it is very well catered for.

Security

Key Management

- Hardware security models
- Cloud Secure Key Management (e.g. Azure KV, AWS, KMS)
- Secret Management Tool (e.g. Hashicorp Vault)

Last but not least, the security aspect of a blockchain platform is mostly tied to its key management and network security. Using blockchain at all requires cryptographic keys associated with your blockchain applications, and those keys need to be stored in a highly secure place. Again, there are several different approaches you can take here:

- **Hardware security models** are actual, physical hardware that is tamper-proof, used for storing your keys. In case anyone ever attempts a breach, details of the attempt are stored and your business can also be made aware of it.

- **Cloud-based security models** offer the same service on cloud, for example by Azure's Key Vault and Amazon Web Services Key Management Service.

- **Secret management tools** are a form of database for storing secrets—an example would be the HashiCorp Vault.

You will need to also ensure that you're able to physically connect to the other organizations on your blockchain network. It's worth speaking with your Information Security (Infosec) teams to ensure there won't be any barriers here. For instance, not every large enterprise would be happy to establish connectivity with a small startup who happens to be on the network too.

Common Concerns

Some of the main concerns potential users may have are:

- **We can't store cryptocurrency in our company.** If you're using a private, permissioned network, this is not really a concern as they do not use cryptocurrencies like the public networks. The encryption keys will be stored in a way that is consistent with the rest of your business applications, in line with what your information security staff are comfortable with.

- **Blockchain is one of the hottest technology skills in the market—how can I ensure I can control my project costs?** If you take on our advice, you'll be able to select a platform and provider in line with your organization's existing skillset.

Having the right team in place is vital to ensure your blockchain deployments succeed. As with all new technology or platform deployments there are a number of tradeoffs and considerations you will need to make along the way to get it right. We've covered here what we believe to be the most important ones, covering the platform deployment - self-hosted, BaaS or managed, the development capabilities for both the blockchain smart contracts and integrations and finally the security considerations.

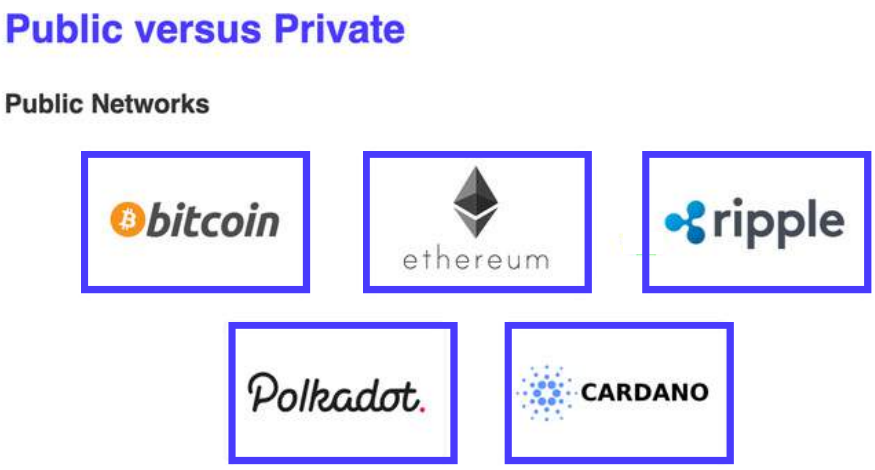
Chapter 7
How To Choose The Right Blockchain Technology

One of the most important factors to consider when implementing a blockchain solution is the underlying platform. Choosing the right platform based on your requirements can save you a lot of time and pain down the line. This is especially true with the sheer number of different platforms available: making an informed choice is key to a successful blockchain deployment.

The first consideration is whether you want to use a public or a private network. Public networks are publicly accessible via the internet and nodes can be run by anyone. They require a payment in cryptocurrency to transact or run applications on the network. The two largest public blockchain networks are Bitcoin and Ethereum, but there are a number of second tier networks available too.

The big perk of public networks is that the infrastructure already exists so you're only building on top of it, which can be cheaper at first as you only need to be able to access a node.

However, you cannot exert any control yourself on the network, which means that any bottlenecks due to high usage will throttle your applications' performance as well. Additionally, you need to buy that platform's cryptocurrency to be able to use it which is simply not an option for a number of organizations.



Private blockchains, on the other hand, are run by consortia and support greater performance, finer grained permissioning and more privacy options than their public counterparts. Hence most people start with a private network. Given their consortia-driven nature, they often align with a specific industry or niche. As its name implies, a private blockchain keeps all the information on the ledger private among participants, it is not visible outside of the consortia (unlike public blockchains).

Top Choices

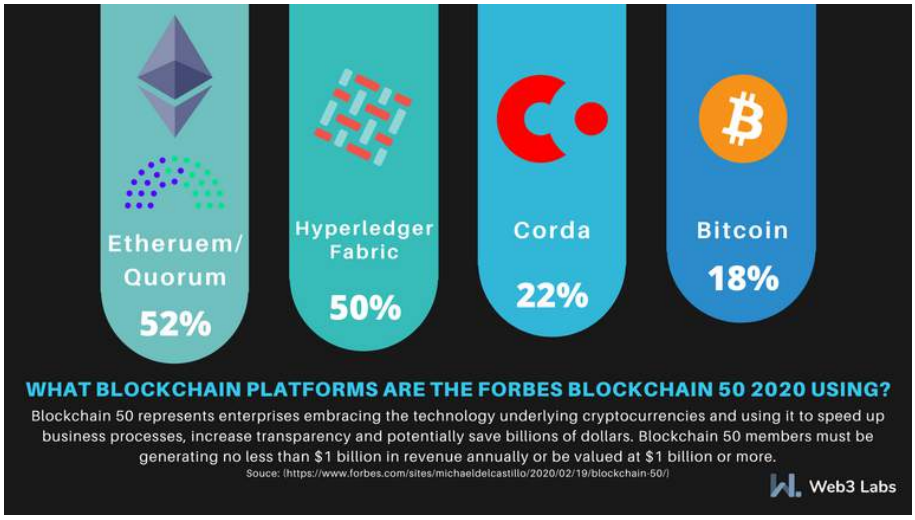
When it comes to choosing a platform that is both private and permissioned, there are three dominant platforms:

- **Ethereum - Quorum and Hyperledger Besu.** Used by companies like Ant Financial, BMW, General Electric, UBS, Microsoft and others.

- **Hyperledger Fabric,** created by IBM. Companies like Broadridge, China Construction Bank, Dole Foods, Honeywell, HSBC, and even Microsoft and Nasdaq have all developed solutions on Fabric.

- **Corda,** created by R3, a consortium of banks focusing on blockchain solutions. Aon is using it for their insurance operations, Daimler is tracking contracts along the supply chain with blockchain, while Credit Suisse, HSBC, and ING Group have all implemented Corda within their financial use cases to try and eliminate heavy paperwork.

In our experience, these are the platforms that the most companies are using. This is also supported by the Forbes annual Blockchain 50 list which provides an excellent grounding in which platforms are being used by the world's largest companies.



Are there other high quality blockchain platforms out there? Absolutely! But these are the most established and widely used. Keeping to a tested, well-established platform will increase your chance of success with blockchain.

Common Resistances

On the other hand, there are some common misconceptions surrounding blockchain platforms.

- **What about this other platform?** It says it is superior to Ethereum, Corda, Fabric... There will always be other platforms that claim to offer improvements on limitations with the existing platforms. However, remember that the most advanced platform doesn't always win - Windows didn't achieve dominance of the operating systems market because it was the most superior operating system. It's no different here. That's not to say you shouldn't explore them, just be mindful of the fact that you could end up having to find and fix issues yourselves with these platforms that were addressed a long time ago in the more established offers. The platforms we've presented are chosen because they're the most mature and widely used in the enterprise blockchain landscape, with significant ecosystems. This increases your likelihood of success when you choose them as your platform.

- **Doesn’t the Ethereum platform use a lot of power?** Public networks, such as Bitcoin and Ethereum, use large amounts of electricity to reach consensus among participants, since everyone has a say. However, creating a private, permissioned network on top of Ethereum or other platforms means you can choose which members can participate in the overall consensus, which lowers the energy consumption. Additionally, the public Ethereum network is moving towards a new consensus mechanism in their Eth2 network.

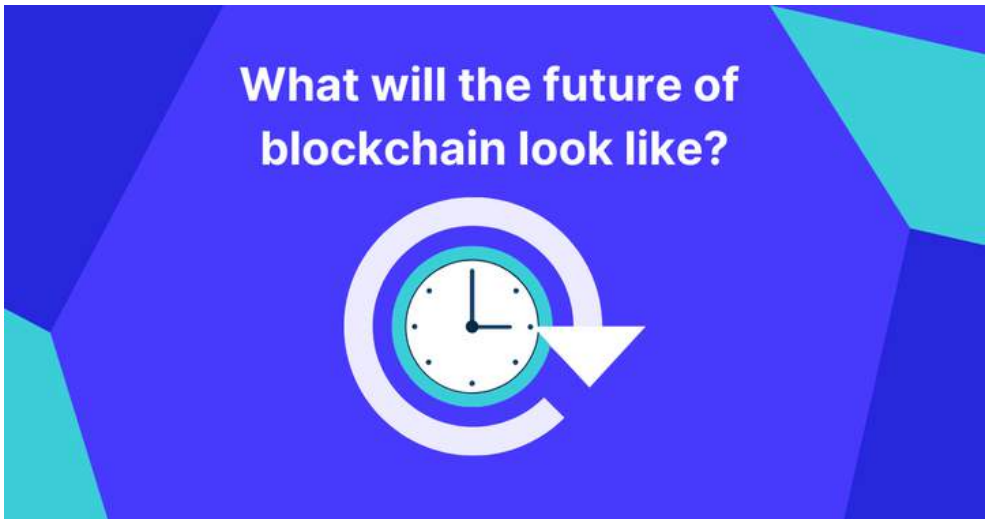
Selecting the right blockchain platform for your business does not have to be a chore. By keeping it simple and staying with the most tried and trusted solutions, you can both get your platform up and running in a reasonable timeframe and maximize your chances for success.

Conclusion

They say the one constant within the technology landscape is change; and although the rate of technological and business innovation appears to evolve at an ever faster pace, the arguments and advice presented here were just as relevant 3 years ago as they are coming into 2021. The difference is now we have even more data to support our perspective than we did back then, part of this is due to maturity of the underlying technology and wider support from established vendors and service providers.

In the proceeding pages we've discussed a number of key principles to have when working with blockchain. We emphasised the importance of selecting the right target problem, team and technology, all of which need to be aligned to create a firm foundation for success. This was supported by a number of relevant examples taken from companies and industry research, the amount of which we have at our disposal continues to grow by the day due to the sheer interest that businesses have in technology.

We hope that by adopting the principles presented in these pages, your company will be added to the body of knowledge available on successful blockchain deployments and may appear on the pages of a future edition of this book.



BONUS CHAPTER
What Will The Future Of Blockchain Look Like?

Like anybody in the tech industry, we're always wondering where we're headed. We're already seeing a colossal pace of change, where will we be in 10 years? Blockchain is just one of many examples, having come on in leaps and bounds since the turn of the century. It's not enough for us to look at the usual two to three-year horizon. It's time to push the boundaries and see where blockchain will be in 10 years.

The year is 2030...

It's now been 10 years since the explosion of decentralized finance (DeFi) protocols, and their subsequent governance structures. In 2020, we were only just beginning to build trust in these protocols, by putting them in the public domain. We soon came to acknowledge their capabilities for enterprise, such as:

- Finance
- Supply chains
- Climate initiatives

Fast forward to 2030, and we're seeing blockchain being used as a core component for tech projects. Huge advances have been made in the corporate and government sectors that have adopted them.

Hyperconnectivity for a better world

By now, most major supply chains are powered by blockchain. In doing so, they're linking a number of carbon registries, which have proven instrumental in tracing emissions offsets. A further benefit was the ripple effect on other countries. We've now seen a significant corporate uptake in helping countries comply with the UN's Paris Agreement.

We have a powerful trifecta:

1. Internet of Things (IoT) for capturing data
2. Blockchain for data verification
3. Artificial intelligence (AI) for validation

These combined forces have helped to address many of the "last-mile" projects that disrupt so many carbon offsetting initiatives.

Blockchain and 5G

With the widespread adoption of 5G, many other sectors have started to provide hyper-connectivity between devices. This is making waves in the mobility sector.

Idle electric vehicles are able to contribute their spare battery capacity to power grids. Meanwhile, longer car journeys are being optimised. They're now capable of balancing passenger breaks with the availability of charging stations – thereby reducing journey times.

The internet's layer of trust

Blockchain has accelerated innovations in cyber security by providing a new 'trust layer' between devices, people and organisations.

These advancements simply didn't exist before. Blockchain has established itself as a new foundational layer atop the Internet's TCP/IP application protocol. This has led to widespread developments in better, more efficient services.

Of course, much of the core plumbing of the internet – TCP/IP, DNS, TLS remains. Today, however, encryption curves have been enhanced to resist against quantum computing. This in itself is edging closer to becoming a 'useful' technology.

Thousands of different blockchain protocols exist in different corners of the internet; however, the big two still dominate: Bitcoin and Ethereum.

Efficiency versus disruption

Tim Wu summed it up a decade ago. Every piece of modern communications technology has eventually succumbed to the controlling embrace of government and corporations.

Decentralized blockchains have not been immune. Thrust into the centre stage, like the internet before them, most blockchains have been tamed. A minority of these have managed to remain truly decentralized.

It stems from a well-worn problem: user stickiness. Just like consumers would jump from one mobile app to another, decentralized platforms suffer similar challenges. This is compounded by the fact that users can 'bring their data with them'.

Crypto trading comes to the fore

Back in 2020, we saw the seeds of this future being planted. Crypto trading apps and payment cards were exploding. They offered users a simple way to earn, hold and invest in cryptocurrencies. Deficit-driven inflation in the developed world led to a stagnation of returns on fiat currencies. This encouraged increasing numbers of people to try crypto to get a better return on their savings.

Certain innovations are well-positioned to change how the underlying financial infrastructure works, such as Central Bank Digital Currencies, payments and T+0 settlement. Bilateral reconciliation via trusted intermediaries is a relic from the past. A similar pattern developed in the 2010s, where the emergence of SaaS platforms drove software from managed data centres to the cloud.

But ultimately, these innovations have brought greater efficiencies to the markets they have served. They've removed some intermediaries in the process, but they haven't displaced the entire system. We could argue, in this case, that crypto was a 'failed revolution'.

Enterprise protocols

It's a rosier picture for the world of enterprise. Large multinationals still exist, and with those, a number of core enterprise blockchain protocols have thrived. Quorum, Fabric and Corda dominate. Numerous other protocols are in circulation, but the combination of community and first-mover advantage for these earlier platforms helped cement their position.

They've been running at scale for many years, and helped support myriad transitions. For example, we now see central bank digital currency across much of Europe, the Americas and China (underpinned by its Blockchain Service Network).

Public protocol adoption with Ethereum 2.0 has also skyrocketed. This allows corporates to transact on top of public networks in a secure manner at speed, in an approach pioneered by the Baseline Protocol. It’s analogous to how VPN allowed organisations to operate securely on top of the internet.

The New Normal

However, not everybody has taken this route. Some continue to prefer complete control over their underlying infrastructure – unfortunately, at a greater cost to the overall network.

But as is always the case with technological innovations, picking the right problem-solving technology is key. Fortunately, by 2030, blockchain is no longer the shiny new tool in the toolbox. It’s proven its value and is empirically dependable. In some cases, it’s even led people to reminisce about the ‘good old days’ – surmounting the inefficiencies and workaround in a world without blockchain.

Web3 Labs

Web3 Labs works with organisations to define and execute their Web3 strategy. Its clients include Microsoft, J.P. Morgan and Vodafone.

It also works with leading blockchain companies and protocols to develop their ecosystems and platforms. The organisations Web3 Labs has worked with include ConsenSys, R3, the Ethereum Foundation and ICON.

- **Production Support for Blockchain Networks**
  We provide SLA-backed production support for Ethereum networks running Quorum and Hyperledger Besu.
  web3labs.com/enterprise-blockchain-support

- **Strategy and Delivery Services**
  From PoCs to MVPs, we can ensure you're prepared for blockchain and DLT technology.
  web3labs.com/blockchain-strategy-delivery

- **Sirato Blockchain Explorer**
  Provides all of the business metrics you need to support your blockchain and smart contract applications.
  web3labs.com/sirato

"Web3 Labs are our preferred partner for Quorum and Besu support due to their significant contributions to these projects and their wider contributions to the web3 and enterprise landscapes."

Madeline Murray, Group Manager at ConsenSys Protocol Engineering