

Accelerating Blockchain

From Proof of Concept to
Implementation



“Blockchain will do for transactions what the internet has done for information.”

Blockchain and distributed ledger technology are quickly gaining traction over the world. Private and public sector organisations are increasingly attempting to apply the technology to reduce costs or improve efficiency. The technology has the potential to make transactions and processes more transparent, trustworthy and efficient. Many are suggesting that it will revolutionise a number of industries. However, despite organisations’ enthusiasm and its rapid evolution, the technology is still in its infancy.

Many ‘proof of concept’ projects that attempt to prove the benefits of a particular use case of blockchain technology are underway or complete. Ultimately, most of these projects will fail and it may take years for potential benefits to crystallise. Even those that demonstrate promise will face many challenges in moving from proof of concept to implementation status.

The Global Leaders Exchange at the Future Blockchain Summit, held in May 2018, was commissioned to further the discussion on distributed ledger technology and formulate a set of outcomes that will accelerate the development of the industry. These sessions, hosted by Smart Dubai and sponsored by PwC, brought together governments, trade associations, policy makers and enterprise to engage in high level discussions and inform a framework to facilitate blockchain proliferation. A particular focus was given to the following:

- ◇ **Overcoming collaboration and interoperability challenges**
- ◇ **The role of governments in enablement and regulation**
- ◇ **Best practices derived from implementation projects in different countries**

This whitepaper summarises the main outcomes from the discussion and puts forward practical suggestions to help organisations make the transition from proof of concept to implementation.





Executive Summary

There is little doubt that blockchain technology has the potential to change the nature of capitalism by bringing more trust, efficiency, transparency and accurate recording to everyday transactions. But before this can happen, challenges must be overcome to allow proof of concept projects to progress to full implementation. These challenges range from technical, to organisational, to regulatory – and are complex in nature.

Education

The need for more and better education is clear. The continued development of a community to further raise awareness and champion the benefits of blockchain is needed to achieve tangible benefits from blockchain technology use cases.

Interoperability

Most blockchain applications are tailored to specific use cases, or industry sectors, and this trend of verticalisation (or specialisation) of blockchains is accelerating. These different blockchain protocols and applications have created the need for interoperability: defined as communicating and exchanging information and value between blockchains. Achieving this goal requires embracing the open source movement, agreeing common standards and establishing trusted blockchains, all of which are complex problems to overcome. The 2018 PwC Global Blockchain Survey highlighted that 41% of respondents cited interoperability concerns as one of their top three barriers to blockchain adoption.¹

Collaboration

Collaboration is arguably more important to the proliferation of blockchain technology. The true benefits of blockchain are only likely to be realised when organisations work together to a sufficient extent – trust, transparency and efficiency can only be achieved at scale and across an ecosystem. Collaboration provides a platform for organisations to pool resources, knowledge and investment to reduce risks and accelerate development. A strong, distributed governance model is critical for success, the attributes of which must include open dialogue, transparency and in some cases independent facilitation.

Role of government

Finally, the role of government cannot be underestimated. Whether as an enabler (through industry advisory bodies, accessible platforms or sandboxes) or as a regulator (by establishing policy), governments have a unique opportunity to be at the forefront of blockchain technology proliferation.

Government organisations such as Smart Dubai are providing vision and leadership to pioneer blockchain technology – enterprise organisations need to follow suit. The time is now to invest in education, identify opportunities for collaboration to drive progress, and engage with regulators and standards setters to establish clarity and stability.



Overcoming interoperability and collaboration challenges

Interoperability

Is interoperability required?

The explosion of Initial Coin Offerings (“ICOs”) in 2017 and 2018 has introduced a huge range of blockchain applications and protocols to the market. Most of these are tailored to specific use cases, or industry sectors, and this trend of verticalisation (or specialisation) of blockchains is accelerating.

More powerful and commercially attractive use cases can be derived by utilising more than one specialised blockchain. For example, one blockchain providing banking or payments services may require identity verification from a second blockchain which specialises in providing distributed identity. Therefore, to fully realise the benefits of blockchain technology it is likely that a greater degree of connectivity and interoperability will be required.



Interoperability is in its infancy and achieving it will be a process, rather than a ‘point in time’ state.

What is interoperability?

There are many different views surrounding the definition of interoperability of blockchains and this was no different within our Global Leaders Exchange. In its simplest form, interoperability can be defined as different blockchain protocols and applications communicating and exchanging information and value, the objective of which is to make information useable in a frictionless way.

It is also clear that the challenge is complex and highly technical in nature. Interoperability is in its infancy and achieving it will be a process, rather than a ‘point in time’ state. In other words, the extent of interoperability will vary over time and will require continuous attention and improvement.

Achieving interoperability

There are arguably greater challenges to solve than interoperability when it comes to moving blockchain forwards. The technology is still evolving to suit specific industry use cases and we believe organisations should continue to focus on solving these problems and demonstrating true business value. This will have a greater impact on the adoption of blockchain technology in the short term.

That being said, several working groups have been set up which aim to promote interconnectivity between isolated blockchain networks, such as The Dutchess Project by Hyperledger and we offer several suggestions to support this goal here.

Open source.

The trend towards open source development is increasing. In order to facilitate interoperability, this trend needs to be embraced. Some traditionalists are struggling to accept code transparency and the absence of code ownership has also been reported to have impacted available funding for full adoption. It is seen as a high risk

to many organisations’ Boards with so many decentralised variables out of their control. We believe the opposite could also be true: open source code helps protect investment because failed ventures can be taken forwards by new enterprises. There is less code wasted. More importantly, knowledge of different protocols and applications needs to be shared to build connectivity.

Standards.

A recent survey conducted by PwC in Asia found that 51% of respondents cited a lack of common industry standards as one of the most significant factors impeding the development of blockchain within the enterprise.² The majority of blockchain development to date has been completed on disparate and evolving platforms, with no commonly recognised foundation or standards to align to.

We believe that agreeing common standards will make the task of interoperability more straightforward. Some organisations are attempting to create standards, for example the ERC20 token standard from Ethereum. At a global level, the International Standards Organisation (ISO) have launched an initiative to create a ‘blockchain and distributed ledger technologies’ standard. There are also national initiatives starting in countries like China who have committed to developing blockchain standards by 2019. These are good starting points but convergence of these standards initiatives will be important to ensure consistency and the ability to collaborate across borders. Again, it is necessary to recognise that the creation of standards will take time. In the absence of this, organisations interested in early adoption of blockchain can benefit from aligning themselves to industry consortia where market leaders, technology vendors and advisory companies are working together to create best practice within a particular industry vertical. Our recent survey highlighted that only 13% of organisations investing in blockchain have taken this approach.²

Trust.


A slightly different take on interoperability could see a number of trusted blockchains with specific use cases providing responses to key questions rather than exchanging information between blockchains. For example, a trusted identity blockchain could be asked to verify the identity of an individual as opposed to providing a second blockchain with the full identity information.

How that trusted status is established could take a number of forms but the starting point would be establishing appropriate governance and controls over the blockchain. It may even be necessary for some sort of auditor or regulator participation in the blockchain to validate transactions and controls in order to provide that trust. In these scenarios the interoperability challenge is somewhat simplified as the chains need to be less intertwined.

Collaboration

Arguably a more important enabler for the proliferation of blockchain technology will be the extent that organisations collaborate on development and scaling of projects. The true benefits of blockchain are only likely to be realised when this happens.

Collaboration has thus far primarily taken the form of industry driven consortia, such as the R3 Consortium. Blockchain consortia have proven to be a great benefit in the development of the technology by



reducing the risk to one specific enterprise and establishing a forum to share knowledge and collectively solve industry challenges. However, the formation and governance of blockchain consortia has a number of challenges that must be overcome, in particular:

Identification of partners.

The process by which blockchain partners are identified and onboarded has proved challenging. Competing organisations will usually have different blockchain goals, strategic priorities and appetites for risk.

Consensus and governance.

When considering a blockchain implementation, ten or twenty organisations may be involved from the outset. Consensus must be achieved consistently throughout via a specific mechanism. Centralised approvals are difficult to manage, if not impossible. This can lead to disputes and if not resolved, organisations may withdraw investment and resources leading to wasted development.

Thus far, implementers have sought to use open source development methods to get around these challenges or have been happy to succeed power to consortia to make decisions, knowing that they were unlikely to move beyond a proof of concept stage and truly impact their business. To progress beyond this, organisations must establish a collaborative structure from the outset, which outlines, confronts and answers the difficult questions that the project will almost certainly face. Questions such as:

- ❖ **What happens if one organisation refuses to progress the project?**
- ❖ **Who pays when a new organisation joins the consortium?**
- ❖ **Who owns the data on the blockchain if an organisation leaves?**

The key to addressing these challenges is establishing a suitable distributed governance mechanism. We believe there are several key elements to achieving this:

Open dialogue.

The importance of early, open and transparent dialogue among public and private organisations cannot be underestimated if the power and benefits of blockchain technology are to be fully realised. In practice, this means having honest, potentially difficult conversations on core issues at the outset (e.g. regulation, taxation, interoperability, scalability), agreeing a common approach and standards, and formalising this in some sort of charter.

Transparency.

In a decentralised governance environment, transparency is key to ensuring trust between parties. Organisations (and humans) have a predisposition towards centralisation and ultimately, self-interest. Clear roles and responsibilities must be agreed between each party, also formalised in the same charter.

Independent facilitation.

Trusted, independent third parties may be required to facilitate important conversations between parties. Trade associations, professional services or regulators could play a role in bringing stakeholders together. As a good example in the UAE, Smart Dubai has identified champions in each industry vertical to educate, understand stakeholder perspectives and facilitate a united vision of success.

1. *Journal of the American Medical Association*, 2000; 284: 1039-1044.

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The role of governments in enablement and regulation

Government as an enabler

Government intervention and regulation is perceived by many as a threat to blockchain innovation and the proliferation of the technology. However, it is almost universally recognised as a necessity to mass adoption, especially when considering certain financial use cases and blockchain ventures such as ICOs.

Whilst it is likely that hyper-economies such as the US and China will ultimately generate the investment needed for large scale innovation and adoption, smaller countries will play a significant leadership role.¹ The Dubai and Estonia governments in particular were cited in the Global Leaders Exchange as being a model for how to provide vision and direction for this complex technology problem. We highlight several of the more effective opportunities as identified during the Exchange:

Industry advisory bodies

Many private organisations are not organised effectively to deal with the significant business change and increased complexity that form the basis of consortia governance, with many industry leaders unwilling to relinquish control of their core processes and products to competitors. Governments can help overcome this challenge by establishing industry specific advisory bodies as well as providing incentivised collaborative investment to help organisations better adapt to the large-scale disruption that blockchain will bring by mitigating some of the risk. Smart Dubai is a prime example of this type of positive government incentivisation and collaboration with the enterprise. Many private companies are actively participating and benefiting from the guidance and governance that Smart Dubai are providing, in particular those within the real estate, financial services and healthcare sectors.

Blockchain as a Service (BaaS)

In many cases, private organisations are still struggling to justify major investment beyond attempts to gain a critical understanding of how blockchain may impact their industry. Following the success and expansion of the cloud model, governments may be in a position to provide a common 'blockchain as a service' platform which will help reduce the cost of infrastructure and other up front expenses, and provide tools to accelerate use case development for enterprise.

Regulatory sandboxes

The establishment of regulatory sandboxes by some governments and jurisdictions has been seen as a positive step in fostering blockchain innovation. The benefits of working in a regulatory sandbox is twofold. Firstly, they provide organisations with an opportunity to foster ideas and develop blockchain solutions without the burden of uncertainty that exists in many the entrepreneurial endeavors in progress across the globe. Secondly, they allow regulators to be heavily involved throughout the entire process, offering an opportunity for both parties to learn and develop, and seek guidance on the relevant regulatory controls. This approach has been especially useful when looking to apply blockchain solutions to already heavily regulated industries such as finance, manufacturing, energy, transport and health. The Abu Dhabi Global

Market, for example, has established a Fintech sandbox.

Code and data transparency

As we've highlighted previously, there is a need for open source collaboration to drive innovation and adoption of blockchain technology. Governments are in a position to drive this level of transparency and some are already embracing this movement. The State of New York in the US has passed a recent bill to open data and open code in 2017. In addition, the Dubai government has also put in place the Dubai Data Law which seeks to classify and make available government data for better decision-making and innovation.

Government as a regulator

It seems clear that governments will play a pivotal role in order to foster innovation, collaboration and investment in blockchain technology adoption. However, this also creates a potential conflict of interest with its additional role as a regulator, because of the required independence of the latter.

For regulation to achieve positive results for both private and public organisations, it needs to be approached carefully.



Putting that risk aside for one moment, PwC estimates that a lack of policy normalisation is the largest factor impeding blockchain development (with nearly half of respondents to the recent PwC survey highlighting regulatory uncertainty as one of their top three barriers to implementation).¹ Therefore it seems equally important to introduce some sort of regulation. However, there is some concern among leaders that unnecessarily regulating blockchain technology will end up stifling innovation. Therefore for regulation to achieve positive results for both private and public organisations, it needs to be approached carefully.

The nature of blockchain technology itself creates a further challenge. The borderless applications of the technology may make traditional approaches to regulation ineffective and so a cautious approach is probably wise.

There are however, heavily regulated industries such as financial services that may require immediate attention. The lack of regulation is preventing investment into valuable blockchain use cases because investors do not trust the legitimacy of projects and are wary of the potential for their investments to be wasted in the event of a change in regulation. This is not just true of cryptocurrency projects but of wider blockchain applications such as the provision of Know Your Customer or Anti Money Laundering services.



From PoC to implementation

There is little doubt that the transition from a successful proof of concept to full-scale implementation has proved challenging for both governments and enterprises to date. Gartner has recently advised that of 398 consultancy service engagements reported to them, fewer than 4% resulted in a production deployment. We have explored some of the major challenges in interoperability, collaboration and the role that governments should play in blockchain adoption. Some other important factors also need to be taken into account to allow organisations to move beyond proof of concept.

Education

Education is arguably the most significant barrier to achieving tangible benefits from blockchain technology use cases. The problem is twofold.

Firstly, for business leaders and regulators, the general level of understanding of the technology, where it can be used to greatest effect, associated risks and how to integrate it into an organisation is poor. This is largely down to the confusion that has ensued from the hype, which has impaired the normal cycle of questioning and learning. In other words, business leaders now seem to be less willing to ask questions of something they feel they are expected to know because it has been so talked about. The nature of the revolution has also meant that the best knowledge is often only available in unconventional forums, such as open source communities that business leaders are not familiar with accessing.



Blockchain today could be compared to the internet in 1995 when we had no idea of Amazon, Uber and Facebook.

The second half of the problem relates to technical skills. It is widely regarded that blockchain technology is in its infancy – blockchain today could be compared to the internet in 1995 when we had no idea of Amazon, Uber, Facebook etc. We may come to wonder how society ever lived without it, but as a consequence of the state of its maturity, the availability of technical skills and training to support development is very limited. This has made it difficult for organisations to research and develop blockchain applications, and will continue to hinder innovation.

Some organisations such as Hyperledger and B9lab Academy are beginning to offer both technical and business education for blockchain systems but there is a need for more and better education, as well as the continued development of a community to further raise awareness and champion the benefits of blockchain. Smart Dubai is taking a bold step forward in this regard. They have identified over 400 champions within each of the industry verticals to educate, understand the different stakeholder perspectives and ultimately help facilitate a united vision of success in order to improve people's lives.


Strategy, vision and risk management

It may seem like a simple step but creating a vision and strategy for the usage of blockchain technology is an important enabler for adoption. The Dubai government, and subsequently the UAE Federal government have created clear and compelling strategies for adoption of blockchain technology.³ This has created a sense of common purpose among government entities and fostered a culture of innovation. The activities of the government have had the added benefit of increasing awareness and international cooperation on the topic, which is strengthening innovation. Other countries are showing similar leadership such as Malta, Switzerland, Estonia and Canada where there is increasing clarity over the direction for blockchain technology.

At a project level, having a clearly defined blockchain strategy is central to the success of any project. But blockchain is a very different technology that demands a new way of thinking and a different approach. First and foremost, a clear understanding of whether the blockchain technology is appropriate to solve the business problem is required – many proof of concept projects will not progress to implementation because they will ultimately derive no true business benefit.

Secondly, strategies and benefits must be articulated in the context of a decentralised environment, potentially one involving multiple parties in a consortium. Different stakeholders could have wildly different objectives, so strategies must be set carefully with all parties in mind.

Finally, blockchain initiatives should be conducted with risk management principles in mind. There are many traditional project challenges that will be encountered during the move into implementation – data migration and integration problems to name two. Effectively building the appropriate project controls that would be seen in any technology transformation can help align blockchain implementations to the same recognisable standards and create a degree of familiarity with project stakeholders. Stringent project governance should be applied and progress, risks and issues should be clearly communicated.



PwC studies have highlighted that over 53% of blockchain projects are being conducted by in-house R&D teams and whilst this is an excellent way to educate and develop internal blockchain capabilities, siloed projects of this nature can often fall short of achieving stakeholder expectations as internal teams focus on achieving small wins and are unlikely to be able to see the larger strategic picture. According to Gartner, if taking this approach, it is possible to overcome these risks through the support of independent third parties who are able to help in one or more of the following areas – strategy, business processes, technology, risk and integration.⁴ Independent assurance and advice over the work produced by in-house teams can help decision-makers trust in the end to end solution, giving them the confidence to move a solution into production.

There is little doubt that blockchain technology has the potential to change the nature of capitalism by bringing more trust, efficiency, transparency and accurate recording to everyday transactions. Governments are providing vision and leadership to pioneer this technology – enterprise organisations need to follow suit.



The time is now to invest in education, identify opportunities for collaboration to drive progress, and engage with regulators and standard-setters to establish clarity and stability. Only then will we see more projects fully implemented with the tangible benefits that are being promised.

¹ PwC. Global Blockchain Survey. 2018. <https://pwc.to/2O8uRbn>

² PwC. 2018 Market survey report for (non-financial) application of blockchain in China. 2018. <https://pwc.to/2Nzyt9y>

³ Smart Dubai. Dubai Blockchain Strategy. <https://bit.ly/2JrQ6BZ>

⁴ Gartner. Market guide for blockchain consulting and proof-of-concept development services. 2018. <https://gtmr.it/2NB9Pp3>


```
for object in mirror_mod.mirror_object:
    mirror_mod.use_x = True
    mirror_mod.use_y = False
    mirror_mod.use_z = False
    operation == "MIRROR_X":
        mirror_mod.use_x = False
        mirror_mod.use_y = True
        mirror_mod.use_z = False
    operation == "MIRROR_Y":
        mirror_mod.use_x = False
        mirror_mod.use_y = False
        mirror_mod.use_z = True
    operation == "MIRROR_Z":
        mirror_mod.use_x = False
        mirror_mod.use_y = False
        mirror_mod.use_z = True

selection at the end - add
mirror_ob.select= 1
mirror_ob.select=1
context.scene.objects.active
("Selected" + str(modifier.name))
mirror_ob.select = 0
bpy.context.selected_objects
data.objects[one.name].select
print("please select exactly one object")

-- OPERATOR CLASSES --

bpy.types.Operator):
    X mirror to the selected
    object.mirror_mirror_x"
    mirror X"

    context):
        active object is not
```




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Future Blockchain Summit 2019 will be from April 3 - 4 2019 at Dubai World Trade Centre, hosted by Smart Dubai.

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