

Blockchain

Emerging use cases



May 2017



Agenda

- 1 *What problem is blockchain solving ?*
- 2 *Selected emerging use cases*
- 3 *Challenges and barriers to implementation*
- 4 *Questions to consider*



What problem is blockchain solving ?

Business benefits

Blockchain provides a number of business benefits that largely play to an efficiency agenda

“Blockchain Technology will fundamentally alter the way financial institutions do business around the world”



“The blockchain protocol threatens to disintermediate almost every process in financial services”

World Economic Forum Report
August 2016



Shared Data – “One version of the truth”

- No rekeying of data
- Eliminates reconciliation breaks



Scalability/Flexibility

- Networked technology has inherent scalability
- Well positioned for cloud



No Single Point of Failure

- No single central authority and no single point of failure within the network



Process Orchestration

- A common platform for all participants makes the end to end process efficient



Smart Contracts

- Automation of key business rules
- Consistent shared transaction behaviour

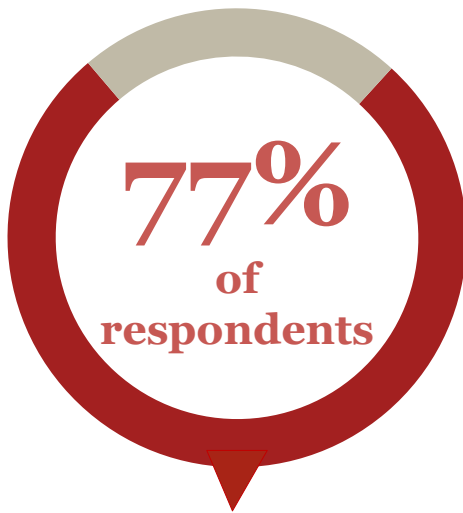


Integrated Messaging

- No need for a separate message service - the data update is the message

2017 Fintech Survey

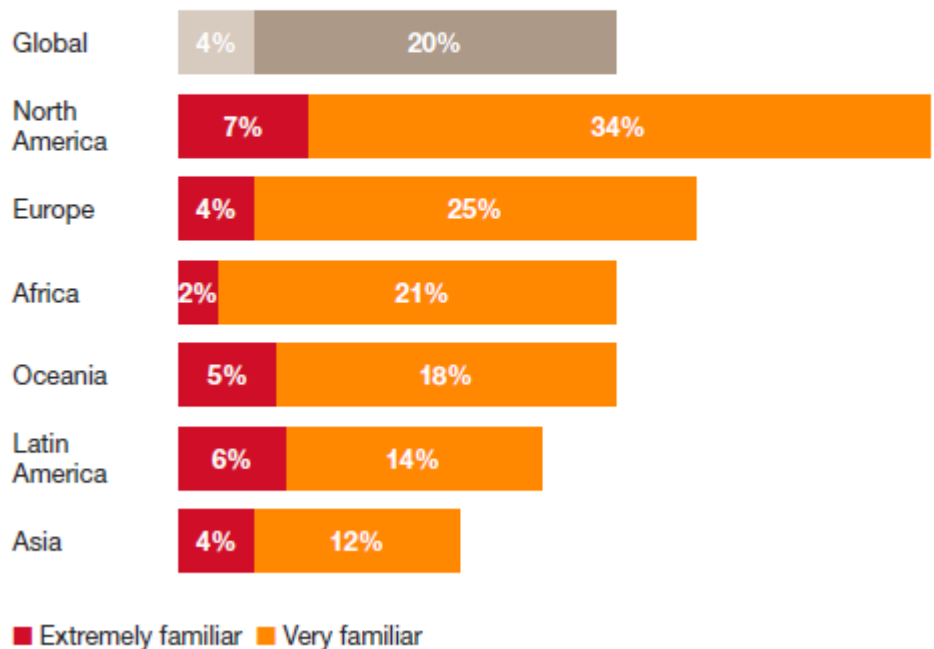
Our 2017 Fintech survey highlights growing familiarity with these benefits and the belief that it will be more widely adopted over the next three years



*Expect to have live
blockchain
applications in
production by 2020*

Figure 11: Familiarity with blockchain

Please describe the extent to which you are familiar with blockchain technology



Source: PwC Global FinTech Survey 2017

...and Government and Regulators taking interest

Whereas initial reaction to bitcoin was negative or cautious governments and regulators are more positive to blockchain



“Distributed ledger technologies have the potential to help governments to collect taxes, deliver benefits, issue passports, record land registries, assure the supply chain of goods and generally ensure the integrity of government records and services..”

Government Chief Scientific Adviser Report – December 2015

*Smart Dubai will design and build a shared Blockchain platform "We're taking the responsibility to **make sure that we shape this nascent technology** and make it happen in a way that really suits [the] city's needs."*

Dr Aisha bin Bishr
Director Dubai Smart City
March 2017

“... the potential of distributed ledger technology to simplify the settlement chain, reduce its cost, and raise its speed while increasing resilience..... we stand ready to act as settlement agent “

Mark Carney Governor
Bank of England
June 2016

*“... The Eurosystem intends to assess their relevance for the different services it provides to the banking communities This investigation will **identify opportunities that these new technologies may provide**, as well as the challenges that they create”*

ECB Consultation Paper,
February 2016

What business advantages does Blockchain offer?

The technology offers the opportunity to drive dramatic changes in business models – it is not the right answer to every possible problem

If the following conditions apply, then blockchain has strong potential to provide a solution:

- 1. Multiple Parties Share Data** - multiple participants need views of common information
- 2. Multiple Parties Update Data** – multiple participants take actions that need to be recorded and change the data
- 3. Requirement for Verification** – participants need to trust that the actions that are recorded are valid
- 4. Intermediaries add cost and complexity** – removal of “central authority” record keeper intermediaries has the potential to reduce cost (e.g. fees) and complexity (e.g. multiple reconciliations)
- 5. Interactions are time sensitive** – reducing delay has business benefit (e.g. reduced settlement risk, enhanced liquidity) or timing of the transaction is crucial
- 6. Transaction Interaction** – transactions created by different participants depend on each other

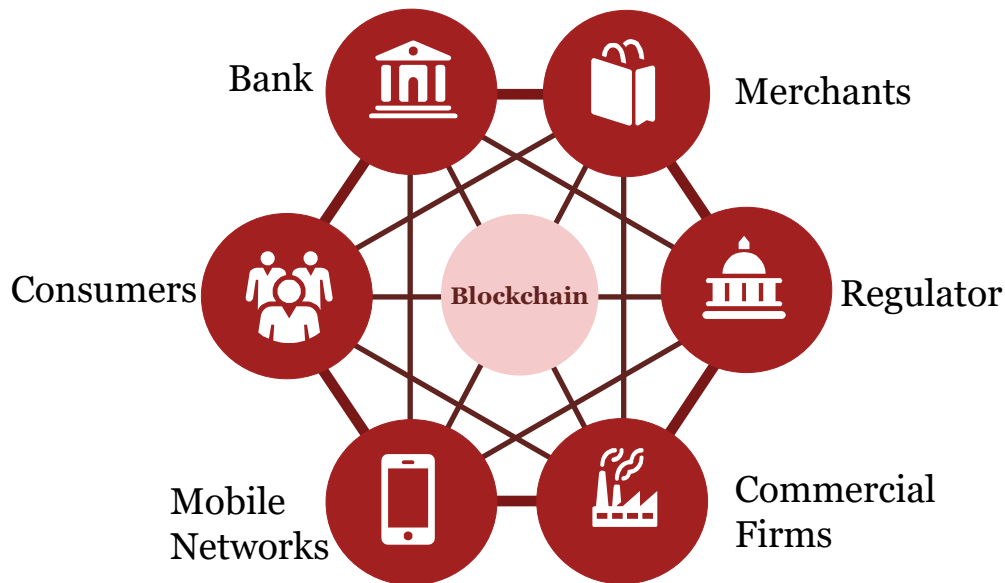
If you can't tick 4 out of 6 ask “Why Blockchain ?”





Realising Business Benefit Will Usually Require Cooperation Between Multiple Participants

Selected emerging use cases

Digital Currencies

Payments and Digital Currency is already in existence for bitcoin and other alt-coins but is also being explored for bank issued currency



Benefits Sought	
	<p>Reduced Cost</p> <ul style="list-style-type: none"> • Reduced intermediaries and lower transaction fees
	<p>Interoperable</p> <ul style="list-style-type: none"> • Reduces fragmentation of liquidity across mobile networks
	<p>Security</p> <ul style="list-style-type: none"> • Payment traceability reducing leakage and fraud
	<p>Access to unbanked</p> <ul style="list-style-type: none"> • Mobile and internet access • Lower fees

Example initiatives

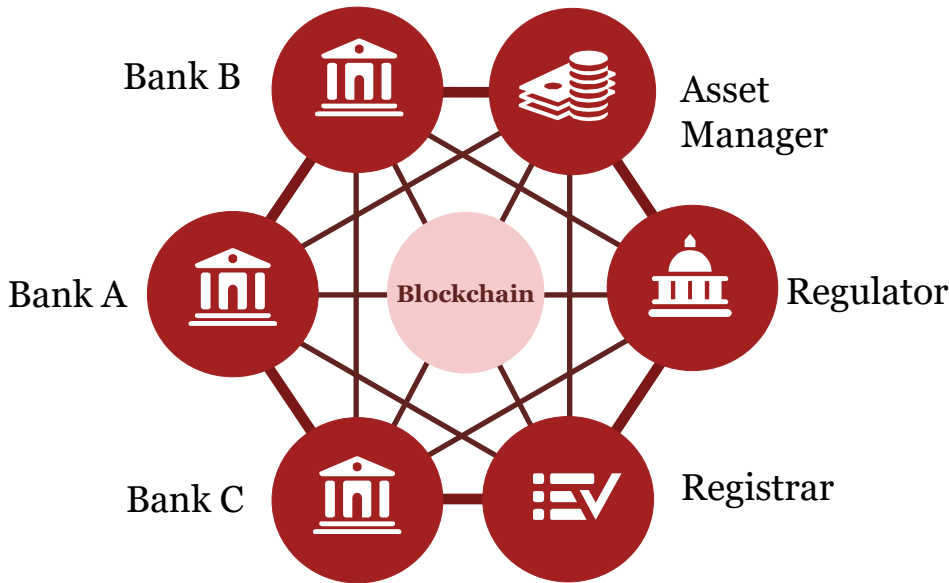
- Bank of China complete a trial in in mid-December 2016 for a central bank digital coin used in conjunction with several major commercial banks
- 5 global banks including UBS are working on a digital fiat linked currency to be used for settlement
- Senegal announced plans to issue eCFA,

Considerations

- Impact on fractional reserve banking
- Potential for digital runs on a bank
- Privacy concerns
- Accounting and balance sheet treatment of digital currencies
- X-Border usage and limitations

Trade Settlement

Trade settlement has been an area of significant interest in particular for securities where multiple intermediaries exist today



Benefits Sought	
	<p>Reduced Cost</p> <ul style="list-style-type: none"> • CSD/Custodian/Messaging fees • Operational efficiency
	<p>Speed of settlement</p> <ul style="list-style-type: none"> • Shorter (T-Zero) settlement • Reduced intermediary windows
	<p>Resilience</p> <ul style="list-style-type: none"> • No single point of failure • Shared position view if bank fails
	<p>Transparency</p> <ul style="list-style-type: none"> • Common reporting repository • Opportunity for regulator node

Example initiatives

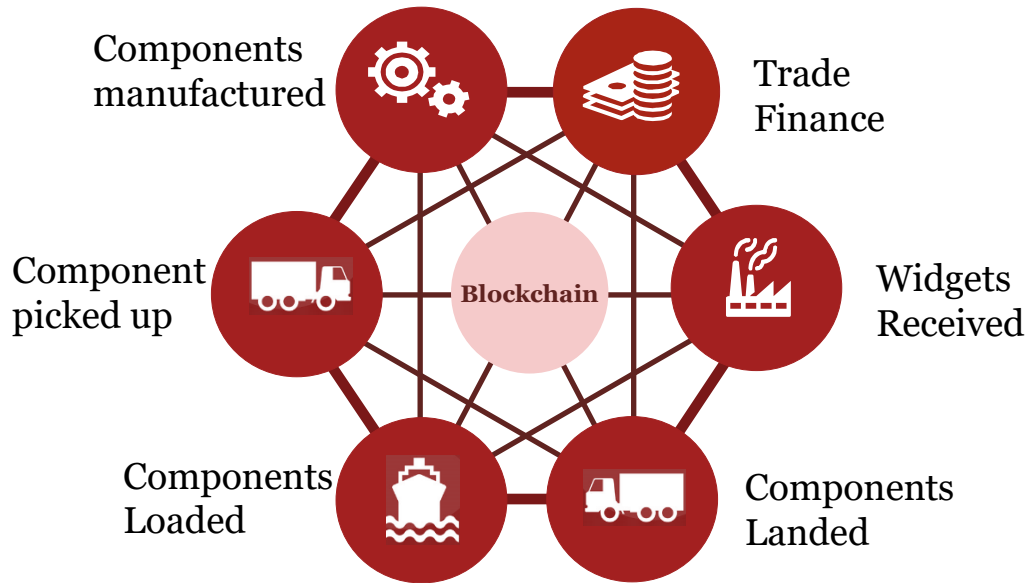
- Nasdaq launched Linq a blockchain based system for privately listed firms in late 2015
- CLS are targeting early 2018 to launch CLSNet a blockchain netting service for 28 currencies
- DTCC, has successfully tested a solution for the clearing and settlement of repos





Considerations

- How to achieve DVP certainty in fiat currency
- Preserving the benefits of netting
- Preserving liquidity – short selling ?
- Confidentiality
- Scalability and performance

Supply chain and Trade Finance

Supply chain is an obvious use case for blockchain and has seen a number of firms announce pilots and PoCs also in the topic of Trade Finance



Benefits Sought	
	<p>Provenance</p> <ul style="list-style-type: none"> • Ability to prove provenance • Helps fight fraudulent goods
	<p>Speed of settlement</p> <ul style="list-style-type: none"> • Trade finance deals executed in hours not days
	<p>Security</p> <ul style="list-style-type: none"> • Reduced theft and leakage • Enhanced security for financiers
	<p>Tax Reporting</p> <ul style="list-style-type: none"> • Potential to create tax transparency and reduce fraud

Developments in Trade Finance

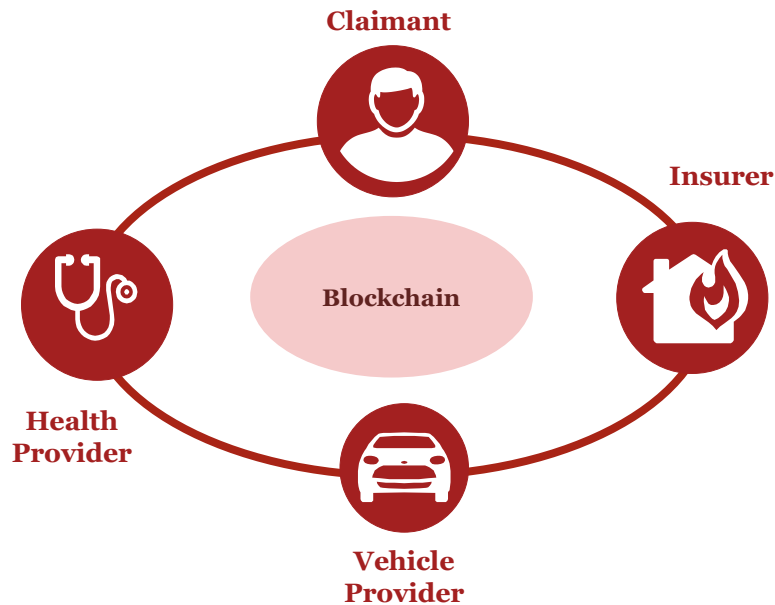
- Barclays have conducted pilot transactions executing a LOC in 4 hours (instead of days)
- Maersk has completed the first test of a system to manage the company's cargos using Hyperledger Fabric and IoT
- Walmart are tracking produce on a blockchain





Considerations

- Scope of processes included in the blockchain
- Confidentiality of information
- How to deal with complex documents
- Extending the chain to other participants

Insurance Claims Management

Blockchain can be used to manage claims enabling pay for redress (e.g. medical treatment, car hire) in an effective efficient manner



Benefits Sought	
	Reduced Cost <ul style="list-style-type: none">• Less administration between insurer, claimant and provider
	Speed of settlement <ul style="list-style-type: none">• Reduced data issues• Automated approval process
	Traceability <ul style="list-style-type: none">• Payment is purposed to a specific use reducing abuse/fraud
	Customer Service <ul style="list-style-type: none">• Customer in charge of redress• Less exchange of sensitive data

Example initiatives

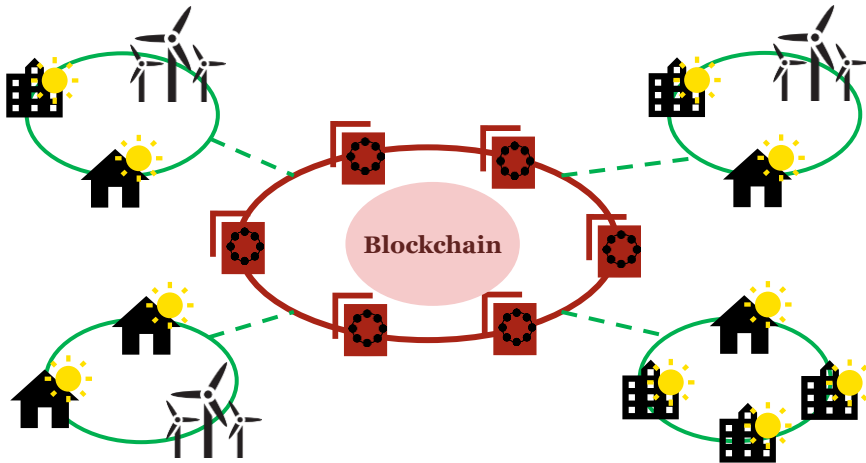
- Allianz has tested a natural catastrophe swap transaction to demonstrate settlement could be significantly accelerated
- Lloyds of London conducted a PoC with PwC to demonstrate the management of the claims process on a blockchain

Considerations

- How to allow flexibility for service providers but protect from abuse
- How to avoid multiple fragmented platforms for each insurer
- Data and technical standards to allow interoperability





Impact on Energy - Microgrids

Encouraging local renewable energy creation and empowering customers & communities to manage and trade renewable energy



Developments in smart meters and grids

- Brooklyn Microgrid (BMG) is building a peer-to-peer energy market for locally generated renewable energy that is driven by blockchain
- IBM, TenneT and Sonnen Group will use blockchain to view the available pool of flexible and enable Sonnen to support the integration of renewable energy sources into the German supply

Benefits Sought	
	Transparency <ul style="list-style-type: none">• Combine blockchain and IoT to manage real time monitoring
	Optimise Renewables <ul style="list-style-type: none">• Match demand and capacity to maximise use of renewables
	Resilience <ul style="list-style-type: none">• Create flexible switching• Speedy detection of failure
	Contract Flexibility <ul style="list-style-type: none">• Use Smart Contracts to automate tariff switching giving flexibility

Considerations

- Scale of data generated
- Performance and resilience
- Commercial scale in particular x-border
- Ability to align commercial interests

Potential wider economic impacts

There are interesting strategic impacts of this technology that government and regulators are considering



Efficient Cost effective financial markets: estimates of cost savings of >\$20bn per annum* globally that could improve *end investor returns*



Resilience of Market Infrastructure: distributed technology has *no single point of failure* so critical infrastructure (e.g. interbank payments) is more robust



Stimulate Trade: distributed technology can reduce risk of fraud in trade finance and speed execution. *Creates liquidity allows funding of lower rated firms*



Financial Inclusion: wider access to financial services through mobile and internet delivered in cost effective manner to *extend financial inclusion for the unbanked*



Tool for Economic Policy : what are the benefits and potential drawbacks of central bank issued digital currency (*BoE estimated 3% boost to GDP***)



Traceable Government Payments: ability to track government payments (e.g. Benefits or Infrastructure Projects) and *reduce fraud/aid efficiency*



Regional Development: ability to create inter-regional cooperation in emerging regions *enhancing x-border trade efficiency* (e.g. inter-regional FX settlement)

Challenges and barriers to implementation

Barriers to implementation

There are business, legal, regulatory and technology hurdles to overcome



Co-operation and establishing standards

- Need for agreed business practice, data and technology standards
- Need for multiple parties to cooperate to deliver business benefit



Legal framework

- Treatment of digital assets and certainty of digital agreements
- Treatment of a Distributed Ledger as a “system of record”



Settling cash in fiat currency

- Any mainstream application will need settlement certainty in central bank money
- There are different solutions but only native CBC provides full efficiency benefits



Scalability, confidentiality and resilience

- Transaction capacity - scalable consensus mechanisms exist but are not mature
- Concerns around operational resilience and confidentiality will need to be satisfied



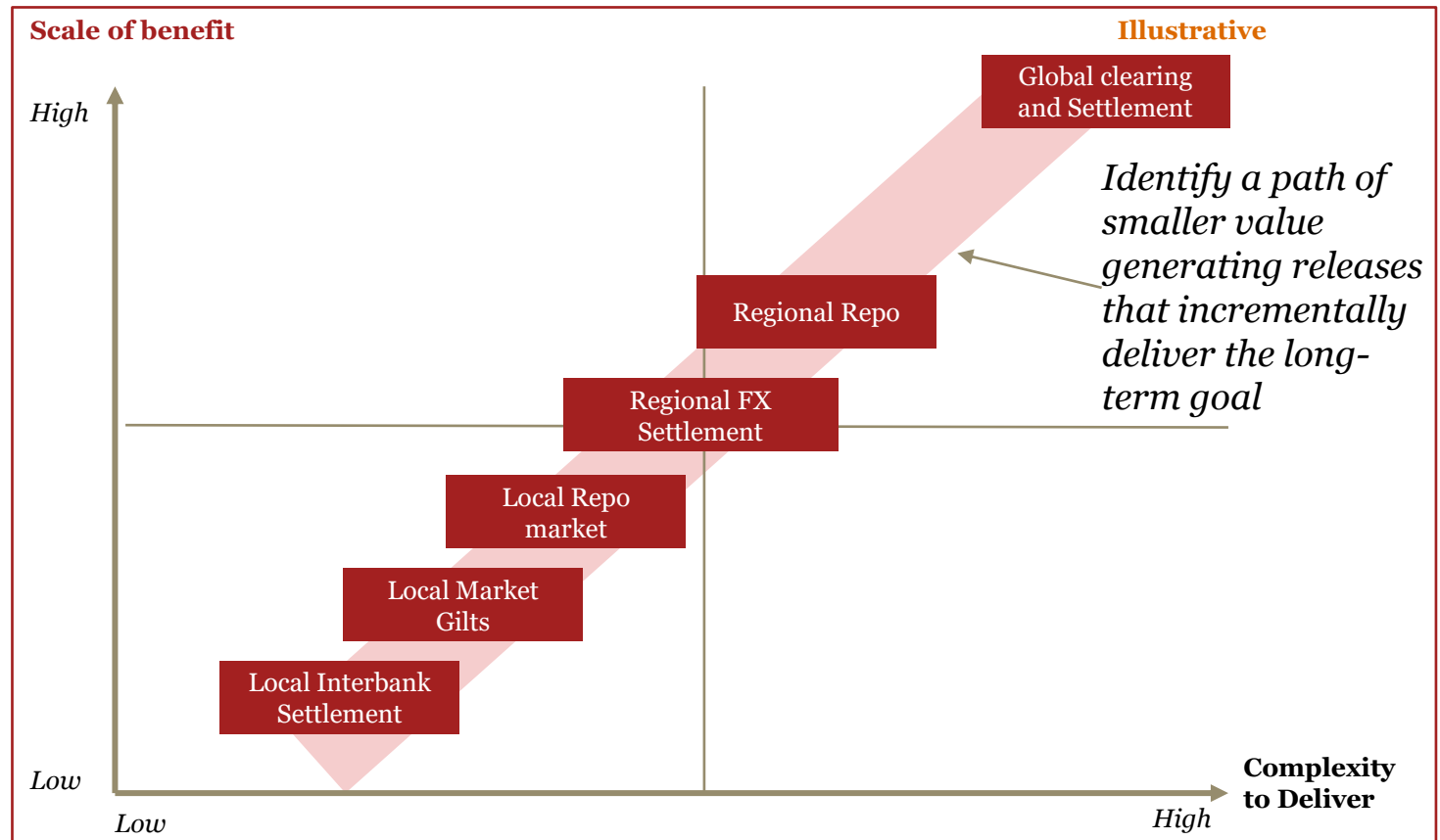
Regulatory framework

- Regulators will focus on how blockchain achieves their outcomes
- Specific local regulations such as bank confidentiality (e.g. Switzerland, Singapore)

Establishing a roadmap

Reduce risk by developing a solution through a series of smaller iterative releases delivering early benefit and progressing to a longer term vision

- **Select lower complexity with identified benefit**
- **Deliver** a live platform that delivers benefit and **practical learning**
- **Burning platform** – is there no incumbent solution or a platform being replaced ?



Key options

Technology decisions such as permissioned versus permission-less is a question of business need and the use cases you select



With a **permission-less** blockchain the identity of participants is either pseudonymous or even anonymous. Anyone can access the ledger to view or add to it.



With a **permissioned** blockchain participants are identified through a managed on-boarding procedure. Various levels of permission are possible that can give users different levels of authorization where required (e.g. Read only access for regulators).






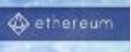


The majority of commercial use cases will implement a *permissioned* blockchain

A permissioned blockchain offers a number of advantages and avoids some of the main concerns that come with a permission-less blockchain:

- **Easier to govern** – A smaller group of known participants will make it easier to agree governance decisions on the update and development of the application (avoiding issues like the Bitcoin block size debate)
- **More cost effective** – Permission-less blockchains require fee structures linked to the size or complexity of transactions to protect itself from spam attacks. Permissioned blockchains also do not have the costs related to storing irrelevant data from others using the permission-less blockchain for other applications
- **Higher Performance** - Consensus in a permissioned blockchain does not need to use computationally expensive and slower proof-of-work algorithms

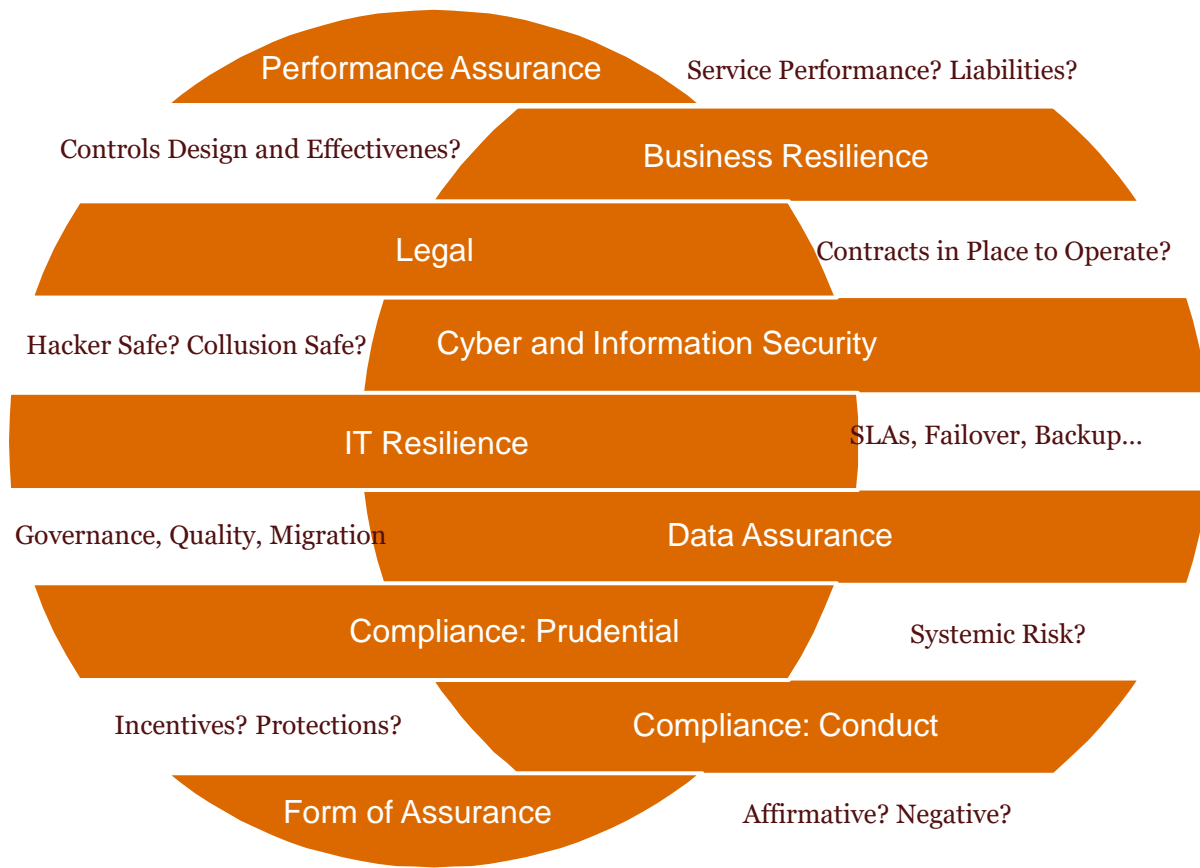
Potential Platforms

The choice of technology partners will also be driven by the specific requirements of the use case – there will be multiple underlying platforms

Company	Description	Maturity	Open ?	High-level features				
				Private	Public	Permis- sioned	Permis- sion- less	Smart Contra- ct
 MONAX	Free software allowing anyone to build interactive applications using Blockchain and smart contract technology (Virtual Machine forked from Ethereum project).	First released in 2014 by “Eris Industries”, which is now “Monax”.	Open Platform	✓		✓		✓
 HYPERLEDGER	The Linux Foundation’s governed open source project with 2 major incubating platforms (so far): “Fabric” and “Sawtooth Lake”. Heavily funded through their 100+ corporate members. “Fabric” is a permissioned smart-contract-enabled Blockchain written in GO.	Initially based on IBM’s Open Blockchain project, it has been open sourced and actively updated since Jan 2016, by an ever growing community.	Open Platform	✓		✓		✓
 Chain	Chain partners with leading financial institutions to build Blockchain networks. Chain solutions enable institutions to design, deploy, and operate Blockchain networks that can power any type of asset in any market.	Launched in 2014. The technology behind Nasdaq’s Linq trading platform & Gyft gift card solution.	Proprietary	✓		✓		
 ripple	Ripple is creating a global real-time payment system by providing enterprise-grade solutions to banks and financial institutions.	First released in 2012, stable since 2015. Third-largest cryptocurrency by market cap.	Open Source	✓	✓	✓		
 MultiChain	MultiChain is an off-the-shelf platform for the creation and deployment of private blockchains, either within or between organisations. Ideal for assets management.	Alpha version released June 2015 based on battle-hardened bitcoin-like protocol.	Open Platform	✓		✓		
 ethereum	Ethereum is a distributed computing platform that makes it possible for any developer to build and publish next-generation distributed applications, through creation of smart contracts written with new languages (solidity) interpretable by their Virtual Machine (EVM).	Frontier (1 st version) was released 07/2015, followed by Homestead in 03/2016. Second-largest cryptocurrency by market cap after bitcoin	Open Platform		✓		✓	✓
 Blockstream	Blockstream was founded to develop new ways to accelerate innovation in crypto currencies, open assets and smart contracts.	First production sidechain released in October 2015 .	Open Platform	✓	✓	✓	✓	
	Open source platform developed by R3 focused on the specific requirements of Financial services and in particular the need for scalability and confidentiality of data	Early access program launched in November 2016 M10 release latest	Open Platform	✓		✓		✓

Getting to live

Large regulated financial institutions will need to ensure rigorous controls and assurance of the new technology



1. Blockchain represents a strategic opportunity for Financial Institutions to innovate and become more competitive and efficient.
2. The impact of this disruptive technology will be felt across functions, silos, entities and indeed, entire industries.
3. Most leading Financial Institutions recognise this and are conducting a number of experiments with the technology.
4. Innovation dollars are precious and business transformation is a highly risky venture that requires a careful and comprehensive approach.
5. PwC is the first major consulting firm to launch a global Blockchain services portfolio to help our clients maximise their risk adjusted return on innovation.


Questions to consider

Questions to consider

Potential questions to consider


- **For all firms**
 - Will blockchain disrupt my business and should we adjust our business strategy ?
 - Are there opportunities to deploy the technology and reduce cost or improve customer service ?
 - Are there already industry initiatives we should join ?
 - Are we considering the impact on the markets we operate in and taking these into account in our three year technology plans (or do we risk high levels of regret spend) ?
- **For firms exploring blockchain**
 - Is the purpose of the business application clearly understood and is blockchain the right technology ?
 - Who do we need to cooperate with to deliver the benefits case ?
 - How do we ensure the technology is resilient, scalable, secure and recoverable ?
 - How will a blockchain we participate in be governed and administered and who will control identity, roles and rights ?

Thank you



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