Blockchain overview

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It's time for another revolution

The internet revolutionised the way we exchange **information.**

Blockchain is revolutionising the way we exchange **value** on the internet.

The value exchange revolution

- Whereas the internet changed the way we communicate, blockchain revolutionises how we ***exchange value*** between multiple untrusted parties.

- Today, to exchange value digitally (such as currency, deeds or diamonds), we rely on ***trusted intermediaries*** such as banks to establish trust between untrusted parties.

- Without blockchain, a trusted intermediary is necessary to ***prevent fraud,*** because when value is represented digitally, it can be duplicated or manipulated.

- Blockchain uses a ***decentralised*** mechanism to establish trust, ***without the need for a trusted intermediary***.

Blockchain decentralises trust, enabling value flow without intermediaries

Blockchain's Components

A blockchain is a **distributed ledger** of all transactions in a network.
Using blockchain technology, participants in the network can confirm transactions **without the need for a trusted intermediary**.

Peer to Peer

In a peer to peer network users are connected to each other without a central point of authority or control

Distributed ledger

Every participant in the network has simultaneous access to a view of the information

Cryptography

Integrity and security of the information on the blockchain are ensured with cryptographic functions

Consensus

Verification is achieved by participants confirming changes with one another, replacing the need for a third party to authorise transactions
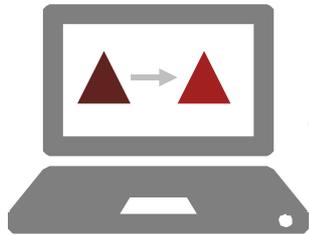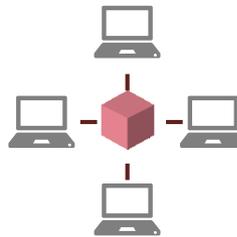
Smart contracts

The ability to run additional business logic means that agreement on the expected behaviour of financial instruments can be embedded in the blockchain
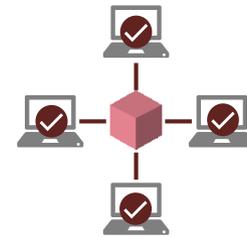
How does it work?

Someone in a network **requests a transaction**

The transaction is **broadcast to other computers** (nodes) in the network

The network of nodes **validates the transaction** using consensus protocols

The **transaction** is complete

The new block is **added to the network's blockchain**, in a way which is permanent and unalterable
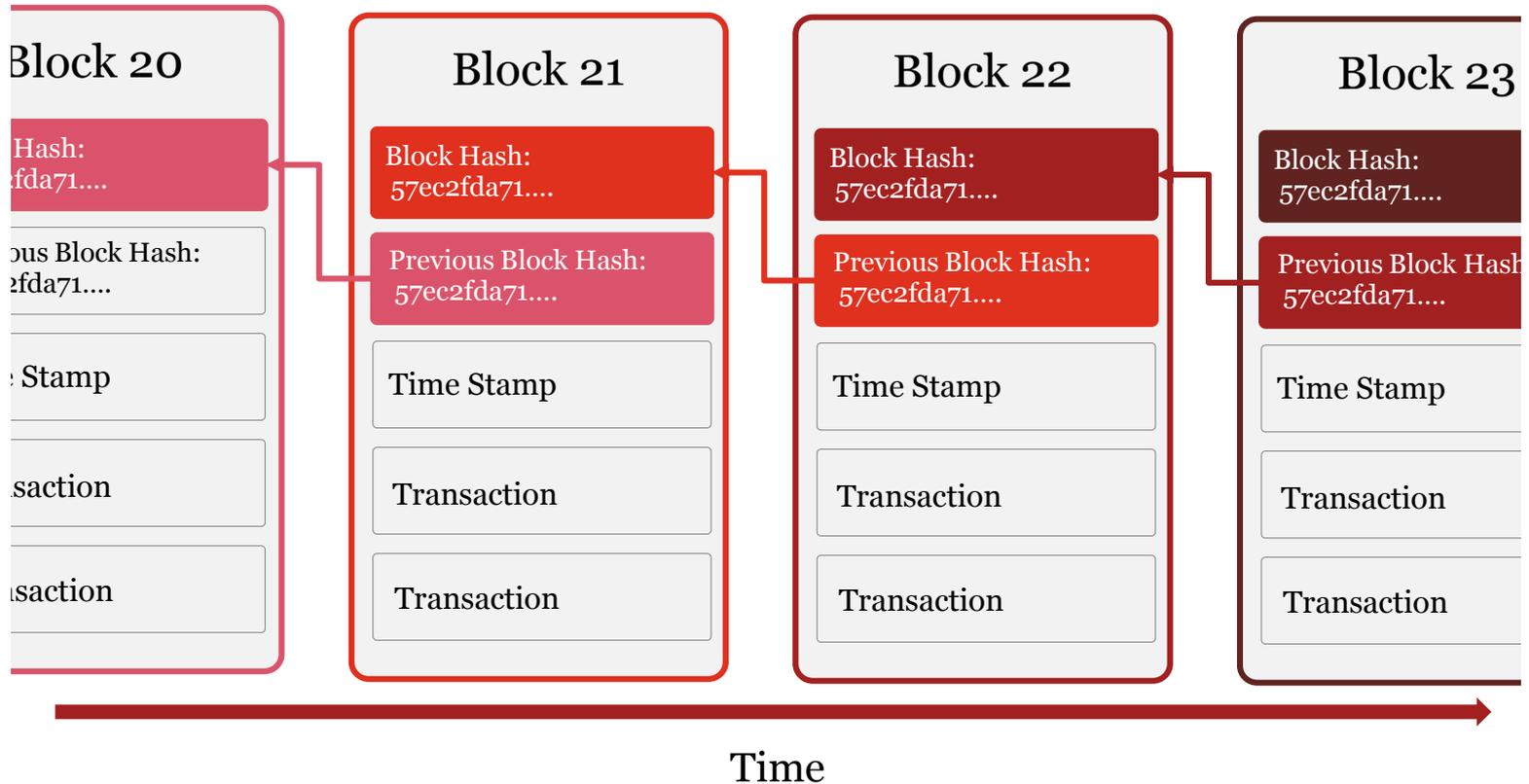
The verified transaction is combined with other transactions to **create a new block of data for the ledger**

A chain of blocks

Each block is a data structure that stores information and contains a validated pointer to the previous block. This 'chains' each block to the previous one

Block 20	Block 21	Block 22	Block 23
Hash: 2fda71....	Block Hash: 57ec2fda71....	Block Hash: 57ec2fda71....	Block Hash: 57ec2fda71....
ous Block Hash: 2fda71....	Previous Block Hash: 57ec2fda71....	Previous Block Hash: 57ec2fda71....	Previous Block Hash: 57ec2fda71....
Stamp	Time Stamp	Time Stamp	Time Stamp
saction	Transaction	Transaction	Transaction
saction	Transaction	Transaction	Transaction

Time

This chaining of blocks is extremely resilient and tamper proof, creating a immutable record of events that is resistant to fraud and corruption

Benefits of Blockchain

Blockchain can remove the need for an intermediary to establish the trust necessary when exchanging value.

Any time you remove intermediaries, there is potential to **reduce:**

Costs **Delay** **Risk**

Blockchain's verification system has the potential to enable near to or real time processing and settlement of transactions.

Blockchain can be used to orchestrate and automate interactions with external parties, as well as within your own processes.

Blockchain has the potential to make many business processes more:

Secure & Resilient

Due to the distributed nature of blockchain, there is *no single point of failure.* This makes it *significantly more resilient* than current systems.

Blockchain utilises battle hardened encryption making it a very secure platform.

Transparent & Trusted

The blockchain ledger can be inspected, changed and validated by all users creating trust through transparency.

Blockchain records are immutable and has an audit trail of changes built in by design, creating trust through transparency.

Where blockchain could be relevant

Blockchain has the potential to make many business processes more automated, secure and transparent.

Record keeping

- Asset registries
- Document registries
- Proof of existence

Provenance tracking

- Supply chain optimisation
- Anti counterfeiting
- Proof of process

Compliance

- Proof of audit
- Regulatory reporting

Identity management

- Reputation based ID

Payments

- Cheaper cross border payments
- Instant settlement
- Micropayments

Contracting

- Automated contracts
- Transparent IP licensing

Blockchain implementations today...

Everledger

Being used to track diamonds through the supply chain. This will help reduce counterfeit diamonds and fraudulent insurance claims.

Factom

Using blockchain technology to form the basis of a transparent permanent and trusted registry for assets. Most notably it was trailed in Honduras for their national land registry, to help combat corruption.

Reporting of clinical trail data

Using the blockchain to timestamp clinical trail protocols when a trial is started. This creates a proof of existence and record of what the purpose and outcomes of the study are.

Provenance
Enabling transparency in product supply chains by leveraging blockchain technology.

La' Zooz

A decentralized transportation platform owned by the community, utilizing vehicles unused space to create a variety of smart transportation solutions.

Nasdaq Linq

Have a blockchain-based platform that has been used to facilitate the issuance, cataloguing and recording of share transfers of privately-held companies on the Nasdaq Private Market.

Blockchain tomorrow...

Internet of things

Blockchain could be the key that unlocks the potential of the internet of thing; allowing them to be autonomous transacting agents

Digital media micropayments

Pay for an article or pay for 20 minutes ad free streaming.

Intellectual property

IP that can license and collect royalties itself through smart contracts

Triple entry book keeping

Blockchain could act as a world wide ledger for all transactions, enabling real time taxation

Decentralised autonomous organisations

Organisations that operate according to predefined software rules

Barriers to implementation
Technology is not the primary barrier to widespread adoption

Co-operation & Establishing Standards

- In order to gain widespread adoption, standards need to be agreed between participants, that create a common set of protocols for individual firms to adopt. This is challenging given the number of participants that need to come to agreement
- For some markets "critical mass" will be achieved by a smaller group that will then work together and create de-facto standards

Regulatory Framework

- Regulators will focus on how blockchain achieves outcomes that align with regulatory concerns (e.g. AML/KYC, Resilience, Recovery and Resolution)
- Specific local regulations will need to be met
- Negative connotations associated with bitcoin impact on regulator's perceptions

Legal Framework

- To trade significant values of assets, firms need to ensure that they can perfect legal title to the underlying asset, recorded by the tokenised asset in the distributed ledger
- An identified challenge is achieving a uniform legal framework across a distributed set of peer parties with no centralised authority

Scalability & Resilience

- Bitcoin's transaction capacity (~3 transactions per second) precludes mainstream adoption
- Regulators concerns around operational resilience will need to be satisfied

Settling value in "real money"

- Any mainstream application will need settlement certainty in fiat currency
- Tokenized solutions pose an added layer of settlement and counterparty risk that will not be acceptable

Addressing the Barriers

Many barriers are more perceived than real. Others are falling fast...

Co-operation & Establishing Standards

- Banks are seeking to find consensus through cooperation , including the R3 led consortium of 42 banks, the open ledger group and Swift
- In parallel both banks and technology providers are pursuing their own technology solutions and Proof of Concepts where they see competitive advantage
- Euroclear has called for collaboration in establishing a standard between key participants.

Regulatory Framework

- Blockchain and distributed ledger technology acknowledged by the Bank of England as "…. a genuine technological innovation that demonstrates that digital records can be held securely without any central authority"
- The ECSDA has responded to ESMA call for evidence on "Investment using virtual currency or distributed ledger technology" outlining considerations from a CSD perspective

Legal Framework

- Bankchain have a live trading environment trading tokenized electronic gold receipts, the confirmed legal representation of physical gold bars stored at COMEX-approved warehouses
- Bankchain approach has been confirmed to work under UK law by Norton Rose

Scalability & Resilience

- Permissioned network SETL claimed in October to have processed 1 billion transactions in a day
- Blockchain's inherently distributed and decentralised nature is capable of providing higher resiliency and availability as demonstrated by Bitcoin's core protocol which has not been compromised to date

Settling value in "real money"

- Bankchain have a working DVP USD cash settlement built into their clearing & settlement solution.
- According to the UK Government December 2015 report SETL aims to have central bank money available on the block chain integrated with the current financial markets infrastructure
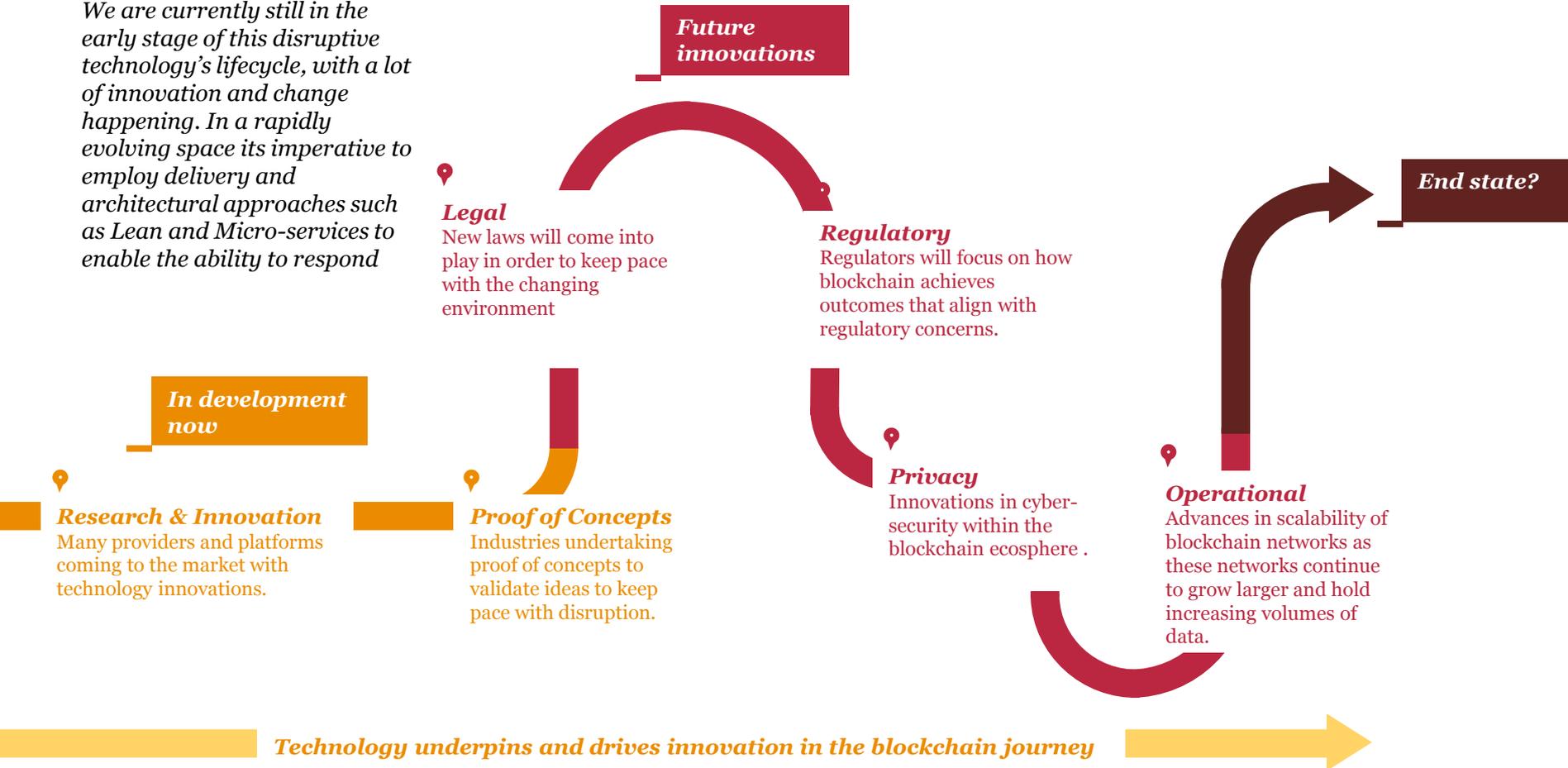
Cooperation and Standards are the biggest barrier

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Technology forecast

The roadmap needs to be developed against a vision for the future for blockchain and the recognition of the need to "design in" flexibility

We are currently still in the early stage of this disruptive technology's lifecycle, with a lot of innovation and change happening. In a rapidly evolving space its imperative to employ delivery and architectural approaches such as Lean and Micro-services to enable the ability to respond

Future innovations

End state?

Legal
New laws will come into play in order to keep pace with the changing environment

Regulatory
Regulators will focus on how blockchain achieves outcomes that align with regulatory concerns.

In development now

Research & Innovation
Many providers and platforms coming to the market with technology innovations.

Proof of Concepts
Industries undertaking proof of concepts to validate ideas to keep pace with disruption.

Privacy
Innovations in cyber-security within the blockchain ecosphere .

Operational
Advances in scalability of blockchain networks as these networks continue to grow larger and hold increasing volumes of data.

Technology underpins and drives innovation in the blockchain journey

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