INNOVALUE

Blockchain applications within the Financial Services industry

Oslo, 3rd March 2016

Agenda

1. **INNOVALUE profile**
2. Blockchain in Financial Services
3. Deep-dive on use cases
4. Conclusions

Innovalue has established itself among the leading specialised financial services advisory firms

Innovalue at a glance

Key facts

- Funded in 2001 with clear mission: “High-value consulting - both feet on the ground”
- A track record of > 400 projects with > 150 clients delivered at high client satisfaction
- A global reach out of our offices in Hamburg, Frankfurt and London
- Over 60 (+56) consultants exclusively focusing on the financial services sector:
  - Payments
  - Insurance
  - Banking

Our proposition

- A business model deeply rooted on four principles:

1) Deep Industry Knowledge
2) Collaborative Advisory
3) Actionable Strategies
4) Tangible Results

Innovalue offers a range of expertise in Strategy, Performance Improvement as well as M&A and Alliances

Functional expertise

Function	Expertise (not exhaustive)	Project examples (illustrative)
 **Strategy**	▪ Corporate strategy ▪ Business unit strategy ▪ Product strategy & pricing ▪ Go-to-market strategy ▪ Innovation	▪ Development of a group product & pricing strategy for a leading online payment provider ▪ Development of a mobile payment strategy for a leading MNO ▪ Development of a market entry strategy to facilitate the international expansion of a leading acquirer
 **Performance Improvement**	▪ Restructuring ▪ Performance improvement ▪ Reorganization ▪ Carve-out ▪ Post-merger integration	▪ Conception and implementation of a business transformation plan for a leading e-money issuer ▪ Definition of target operating model for business operations of global terminal producer ▪ Post-merger integration for a leading provider of global online payment solutions
 **M&A & Alliances**	▪ M&A strategy ▪ Commercial due diligence ▪ Transaction support ▪ Strategic alliances and JVs ▪ IPO preparation and fund raising	▪ Development of M&A strategy for a top-tier acquirer with focus on online payments ▪ Commercial DD for a payments and loyalty company ▪ Negotiation of cooperation agreement between leading MNO and m-acceptance solution provider

Innovalue's Payment practice are chaired by experienced senior professionals and operates globally

Innovalue Senior Payments and M&A Team

Kai-Christian Claus (Managing Partner)
- Issuing, acquiring, processing, PSPs, mobile
- Growth strategy and restructuring
- M&A and alliances

Francesco Burelli (Partner)
- Issuing, acquiring, processing
- Market entry, growth strategy and restructuring
- M&A (transaction support, due diligence, valuation)

Andreas Habersetzer (Partner)
- Issuing, acquiring, processing, PSPs
- Growth strategy and restructuring
- M&A (due diligence, valuation, negotiation)

We have extensive experience in advising an established client base in activities related to strategy, M&A and performance improvement

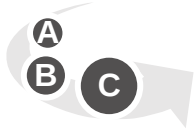
Clients sample

Agenda

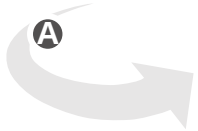
1. INNOVALUE profile
2. **Blockchain in Financial Services**
3. Deep-dive on use cases
4. Conclusions

To analyse the market we looked at 3 key questions in order to capture the state of blockchain technology in financial services

Conceptual framework for analysis



Most definitions of blockchain is still (debatably) based on its Bitcoin application …

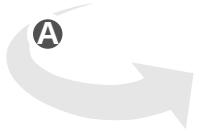


- A blockchain is a public ledger of all Bitcoin transactions that have ever been executed. It is constantly growing as 'completed' blocks are added to it with a new set of recordings. The blocks are added to the blockchain in a linear, chronological order – *Investopedia*

- Blockchain is a critical part of the bitcoin peer-to-peer payment system. The bitcoin system works using a blockchain ledger to record transactions. Bitcoin is a global cryptocurrency that can be used as a medium of exchange. However, while many parties have started to accept bitcoin as a currency, it is still controversial and poses risks in terms of security and stability – *Techopedia*

- The blockchain is essentially a giant record book of all Bitcoin transactions, it is to Bitcoin what the internet is to email. This is the decentralised network where every bitcoin transfer is verified, processed and written down. It has the potential to make economic interactions cheaper, faster and more secure. The idea is to remove the need for middlemen like banks to vouch for facts, such as a person's identity or the health of their finances — authentication processes that can be slow and costly, and vulnerable to corruption and cyber attacks. Instead, the blockchain relies on a combination of code-breaking and crowdsourcing that aims to create a self-maintaining and reliable system of record – *FT Lexicon*

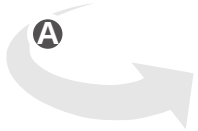
… or to a its virtual currency application



- The blockchain “is the ledger (book of records) of all transactions, grouped in blocks, made with a (decentralised) virtual currency scheme.” - *ECB*

- A block chain or blockchain is a permissionless distributed database based on the bitcoin protocol that maintains a continuously growing list of data records hardened against tampering and revision, even by its operators. The initial and most widely known application of block chain technology is the public ledger of transactions for bitcoin, which has been the inspiration for similar implementations often known as altchains *- Wikipedia*

What does the block chain do?

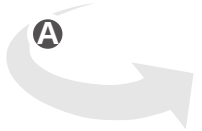


The blockchain enables the exchange of information, in a synchronous and even manner allowing two parties in a network to complete transactions without the parties being either necessarily known to each other or guaranteed by a third party

It effectively enables a collective book keeping system on the internet, which constantly updates and, with the aid of mathematical function, allows participants to reach a common agreement on the approval of the transactions

But overall, what are the advantages of the blockchain? Is it a revolutionary technology or a hype?

The blockchain has four unique advantages that are peculiar to is architecture



- **Data immutability:** Blockchain allows for a complete record over time, which is guaranteed by the previous blocks of data “chained” together

- **System resilience and speed:** Blockchain allows for real-time movement and settlement

- **Transparency and consensus of the data:** Blockchain provides for shared, agreed data

- **Automated logic:** Blockchain provides for the ability to automate logic and build that into the database so it can be executed once you have consensus

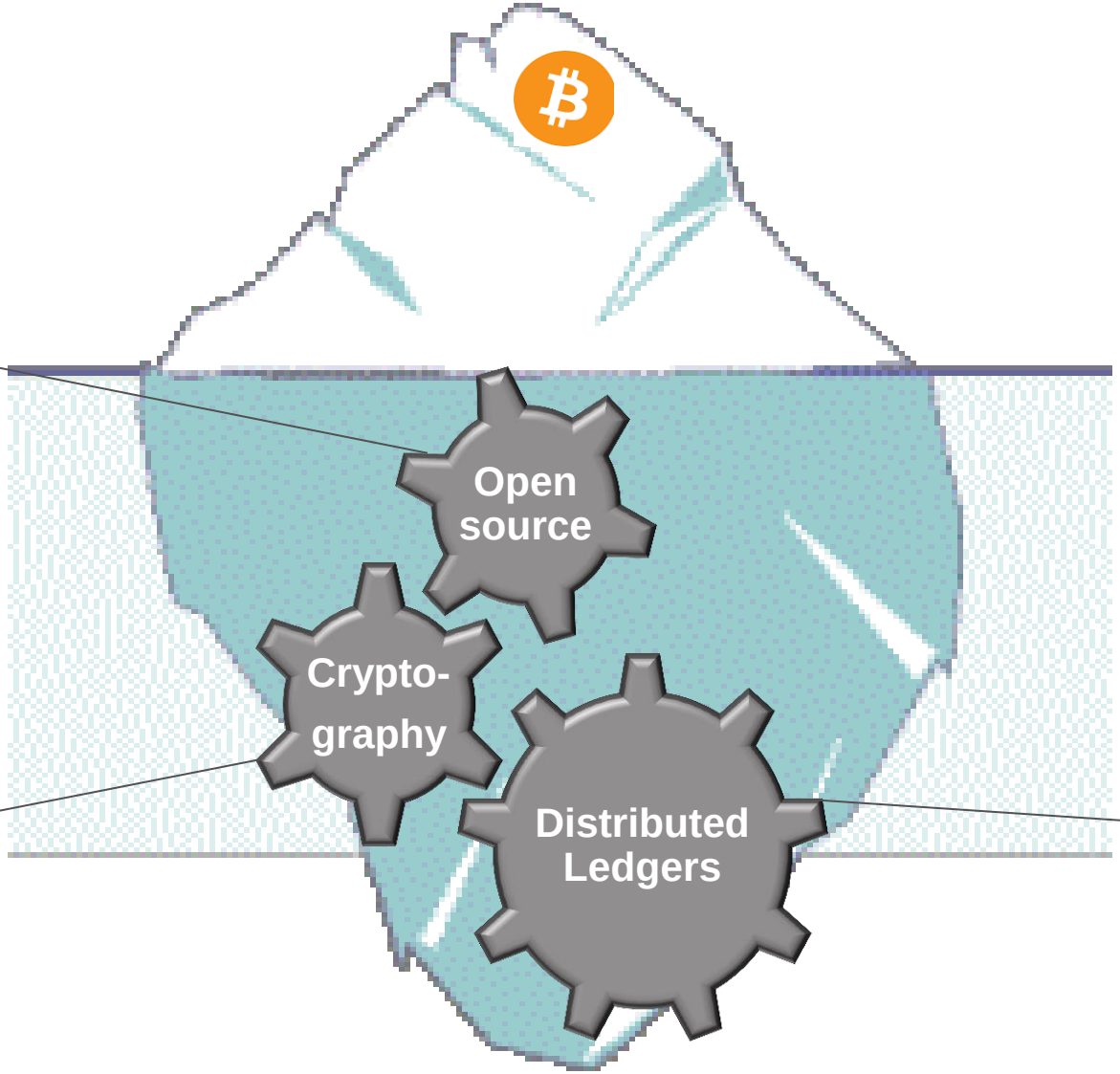
The bitcoin is powered by three technology concepts that form the basis for the blockchain technology

Open source software

"Open source software is software that can be freely used, changed, and shared (in modified or unmodified form) by anyone."

Cryptography

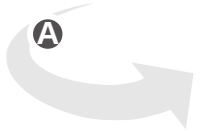
"Cryptography is the use of codes to convert data so that only a specific recipient will be able to read it, using a key"



Distributed ledger

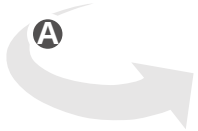
"a ledger containing the record of all transactions by all users [that] is publically available to all"

How does the blockchain work?



Transaction definition	Transaction authentication	Block creation	Block verification	Block chaining
“Buyer” agrees a transaction and transmits a **transaction message** including “details” of the “Seller”, the transaction value and a unique digital signature (private/public key) that proves the authenticity of the message	Network’s nodes (computer/users) receive the message and **authenticate** the transaction‘s validity by decrypting the private/public key signature. The authenticated transaction is virtually placed with other recently authenticated transactions	A node **creates a block** which contains the list of recently authenticated transactions. The node broadcasts the block to the network as new block to be registered in the ledger	Network nodes receive the block and validate it through an iteration process (“proof of work”) = several nodes individually combine three inputs from the block (the transaction list, the header and a numerical value) to validating the block	The first node to validate the transaction, “chains” the block to the blockchain and the extended blockchain is broadcast to the network.

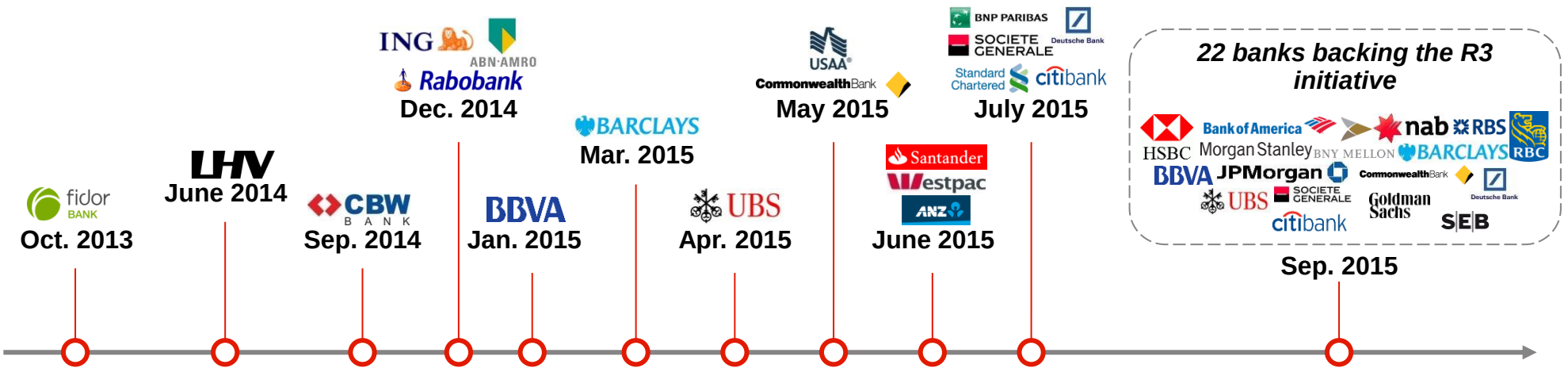
There could be different types of blockchains based on their characteristics



Access	Infrastructure	Block's content size
Open The participation to the network is open to the public / those interested in taking part to the network	**Homogeneous** System requiring same hardware and software	**Limited** The blocks within the blockchain are of limited size (in bits) and contain limited amount of information
Closed The participation to the network is restricted to a selected number and type of participants	**Heterogeneous** System is able to operate on multiple hardware and software	**Extensive** The blocks within the blockchain have a size such it can contain a larger amount of information

Blockchain based technology and its potential have become of interest for many financial institutions

Stated interest and engagement in the blockchain / distributed ledger technology by banks



"In contrast to today's transaction networks, distributed ledgers eliminate the need for central authorities to certify ownership and clear transactions. We expect the distributed ledger and smart contracts to dramatically reduce costs" **Santander, June 2015**

"Bitcoin has solved a technical challenge and the currency it hosts has been successful so far. Today, anyone can create their own blockchain based network" **BNP Paribas, July 2015**

"Whilst the technology associated with distributed ledgers is still in its infancy we believe that it presents a potential opportunity to realise a number of important benefits including: more stable and resilient systems, faster processing of transactions and lower costs for bank customers" **Deutsche Bank, July 2015**

"The distributed ledger technology has a huge potential, offering banks and their clients the prospect of enhanced security, lower costs and improved error reduction" **HSBC, September 2015**

Source: INNOVALUE Research

The current use cases are mainly connected to payments and currency, but there is a strong interest in other topics

Range of blockchain applications

What?	Money-/ Currency Exchange	Programmable Money	Digital Assets	Data Storage
Description	The blockchain is able to provide real time payments, 24/7 with rapid settlement and without requiring a bank account	'Programmable money', or money with 'in-built functionality, enables users to encode requirements into a payment instruction in order to achieve autonomous, self-executing contracts	Digitalization of assets would permit transfer of the assets without the currently involved third parties and to disrupt the current management of post-trade operations	The blockchain can be used as a trusted P2P network for document storage
Possible applications	Digital currency Micro-payments Remittance Financial inclusion Clearing, settlement and reconciliation	Betting Crowd-funding / donations Multi-signature accounts	Digital bonds Content distribution Patents Land / marriage registration Smart property	KYC / identity management Cloud storage Voting Audit

Source: INNOVALUE Research

Banks adopt different strategies to approach Blockchain technology

Strategies to enter and build knowledge of the blockchain technology

How?	Approach	Benefits	Disadvantages
Internal Development	▪ Hiring blockchain experts ▪ Refocusing R&D on blockchain ▪ Establishing a dedicated research unit	▪ Flexibility in platform development ▪ First mover advantage ▪ Quick; no external coordination	▪ Small knowledge base to build on ▪ Platform might only be of use internally; low scalability ▪ Expensive initial investment
Cooperation	▪ Joining other banks in development ▪ Working with existing blockchain market players ▪ Partnering in development groups	▪ Reduced costs of development ▪ Higher platform usability ▪ Benefiting from previous knowledge	▪ Slow development due to coordination ▪ Small USP potential for individual firms
Direct Investment	▪ Acquisition of an existing blockchain player (aiming to integrate business) ▪ Using VC investments to acquire stake of a market participant	▪ Reduced development time ▪ Building on existing knowledge ▪ Potential to develop USPs	▪ Investment risk due to little technology know-how ▪ Not tailored for use in internal use (e.g. IT, processes, platform, etc.)

Source: INNOVALUE Research

R3 is among the largest cooperation initiatives and aims to establish consistent standards for the blockchain and gain network effect

R3 CEV - project

FOCUS – COOPERATION STRATEGY

R3 CEV

- "Wants to establish **consistent standards and protocols**, while linking **bank collaboration on research**, **experimentation** and **design of prototypes** to create a "network" effect."
- R3 is focusing on 3 key areas:
  - ***Crypto 2.0****:* Intelligent application of crypto-technology and blockchain-based protocols to potentially solve age-old challenges
  - ***Exchanges***: Creative execution solution that is intelligently nuanced to improve the trading experience for existing and evolving asset classes
  - ***Ventures***: Targeted early stage investments in global companies that will shape the next generation of financial services

Members

Goldman Sachs, HSBC, COMMERZBANK, BARCLAYS, BNY MELLON, SOCIETE GENERALE, JPMorgan, Deutsche Bank, TD, nab, BBVA, RBS, citibank, STATE STREET, Bank of America, Morgan Stanley, UBS, RBC, SEB, CommonwealthBank, CREDIT SUISSE, Mitsubishi UFJ Financial Group

Benefits

- Network effect
- Optimization of internal investments
- Standardization of protocols and interconnectivity of eco-system

Disadvantages

- Loss of first mover advantages
- Loss of potential competitive advantages in the value proposition

Other cooperation initiatives

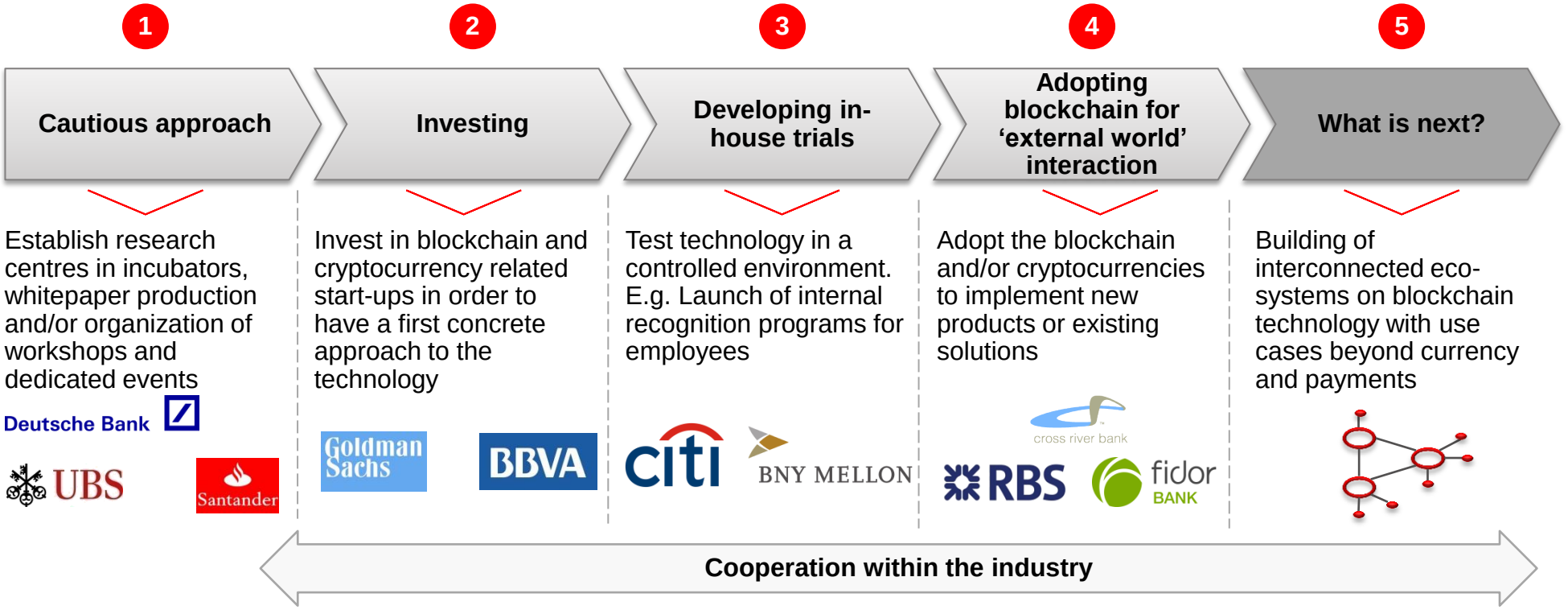
- Commonwealth Bank, Westpac and ANZ are trying to leverage their geographic presence and strategy towards the blockchain to create synergies, reaching the critical mass needed for payments
- ING, Rabobank and ABN are adopting the same tactic

Source: INNOVALUE analysis, R3 CEV official website, R3 CEV Linkedin, FT.com

Depending on the strategy used, current banks' positioning can be seen through 4 maturity stages, with best practices quickly adopting technology for the new or existing products

The blockchain and cryptocurrencies maturity

Blockchain and cryptocurrencies maturity stages



- **FIs tend to approach the blockchain technology in a progressive way going through logical steps of action**
- **However some players skip conceptual maturity steps and quickly reach "best practice" positioning**

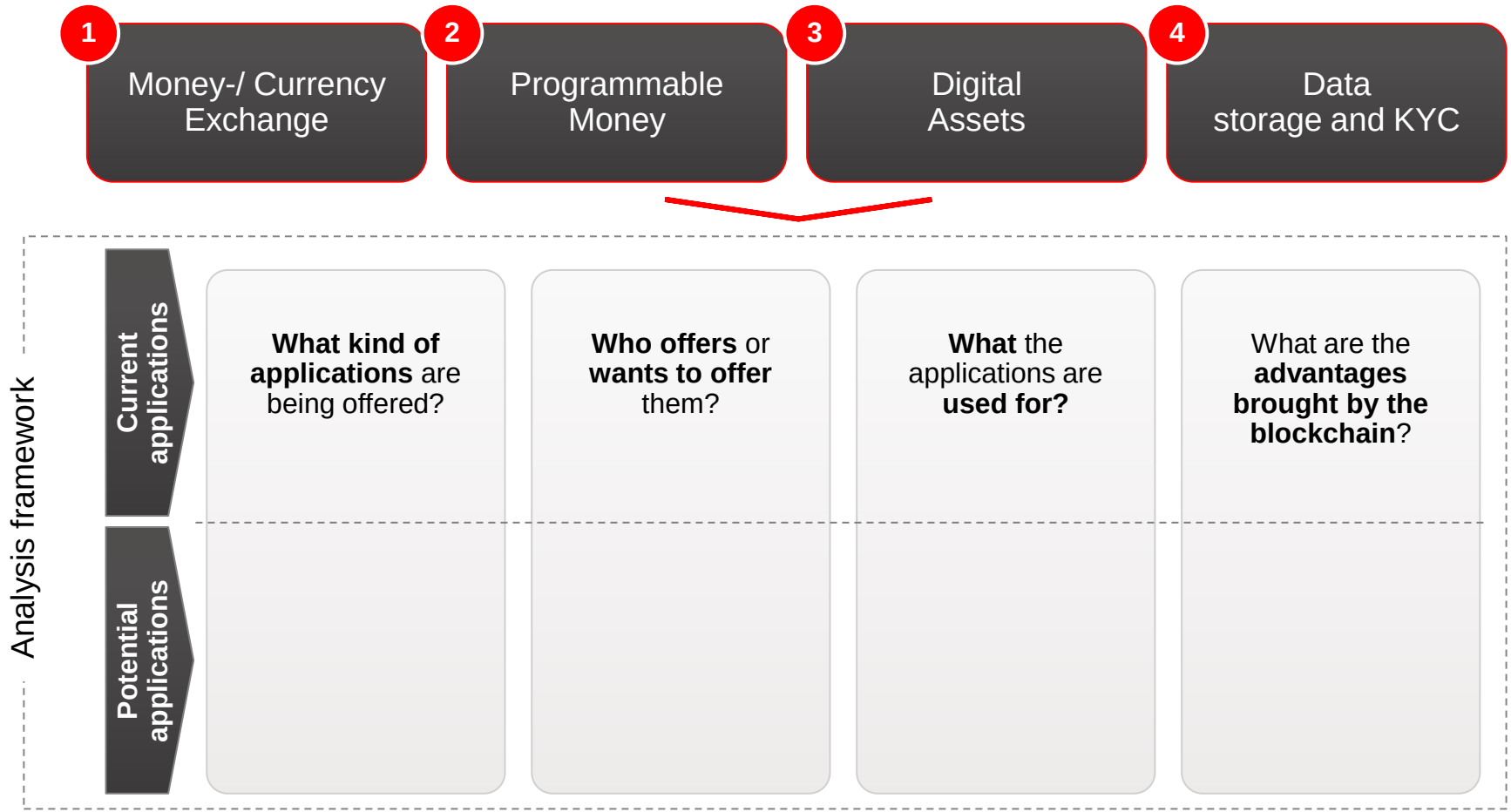
Agenda

1. INNOVALUE profile
2. Blockchain in Financial Services
3. **Deep-dive on use cases**
4. Conclusions

Blockchain use cases were further analysed through a consistent analysis framework

Categories of use cases of blockchain technology and analysis framework

1 2 3 4



Source: INNOVALUE analysis

As Bitcoin related applications have been on the market for several years, FIs are adopting applications for money / currency at a high rate

Use cases of blockchain technology – Money-/ currency transfer

	Types of application	Who is investing	How is it used
Current applications	Virtual Currency for internal use; e.g. “Citi coin”	citibank, BNY MELLON	Developing a virtual currency for the internal money transfer
	Digital wallet enabling P2P payment; e.g. “cumber”	LHV	Beginning development of a blockchain based wallet with cumber
	Blockchain based online platform for money transfer	Westpac, ABN·AMRO, Santander, ANZ, ING, Rabobank	Partnering with- or investing in ripple (functional deep-dive on the next slide)
Possible applications	Settlement infrastructure	SETL	Using blockchain technology for money processing and transfers

The majority of applications appear to have been adopted by some FIs

Blockchain advantage

- The **standard** currency **exchange** process characterized by a **variety of steps** and settlement **risks**
- A **blockchain transaction** is based on a distributed ledger **directly connecting** both **parties** (reducing risk and costs)
- Offering access to digital currencies and blockchain based solutions can **attract new-** and / or retain **old customers**
- Instant and easy money transfer is becoming a **customer demand** and critical part of bank’s value proposition

Source: INNOVALUE analysis

Ripple protocol is among the most used by banks, as it enables users to transfer funds across international entities using the internet of values

Ripple protocol

Ripple and its Protocol

What is Ripple?

- A physical pre-funded network of computers running a common open-source software developed and maintained by Ripple Labs
- Provides global financial settlement solutions to enable the world to exchange value in the same way that it already exchanges information

What is the Ripple Protocol?

- A set of rules for transaction clearing and settlement
- Similar to other Internet protocols – e.g. SMTP for email and HTTP for websites – Ripple Protocol is a set of rules that govern how Internet-connected computers communicate with each other

What are the advantages?

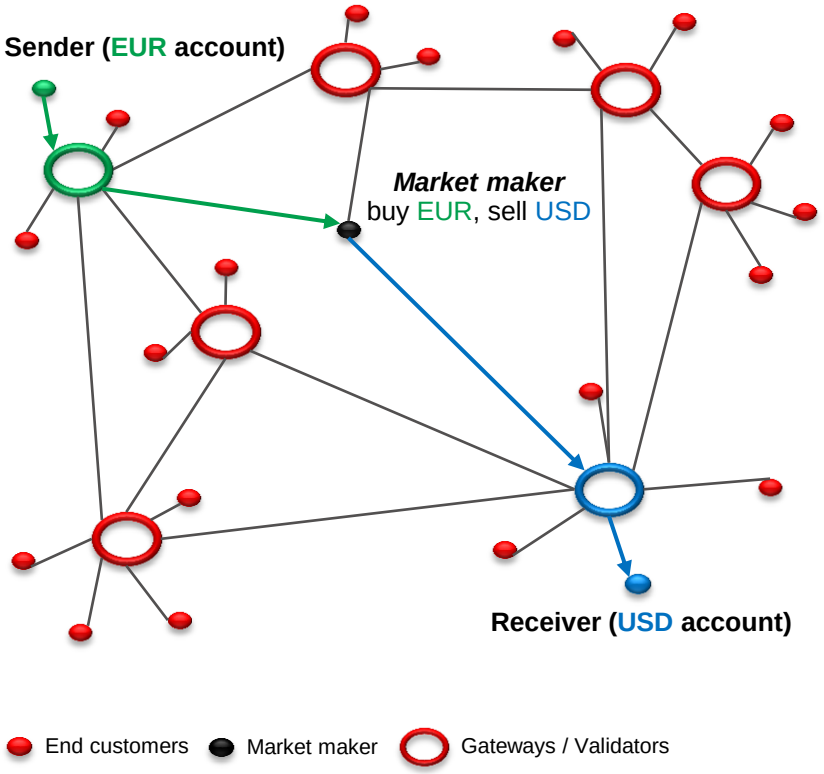
- A free open-source software
- Ripple Labs does not operate the network, collect fees, or limit access
- Does not dis-intermediate banks or its financial services users/partners, since (like the internet and the email protocols) no company can stop access to them and control them

Source: INNOVALUE analysis, Ripple official website, SWIFT official website

The absolute majority of banks use the Ripple protocol as a network provider that allows account-to-account fund transfers in any currency

Ripple

The Ripple network



How it works

- Multiple banks are connected to Ripple to establish a correspondent agreement either bilaterally or through clusters in order to transact on a peer-to-peer basis
- The network is composed of:
  - *Users*
  - *Gateways*, access point to the network for end users
  - *Pathways*, actual interconnections between gateways
  - *Market makers (typically hedge fund or FX trading desk)*, act as currency exchange and provide liquidity to the network through pre-funded accounts
  - *Validators*, servers that approve transaction through consensus
- A bank can act as a gateway, as a market maker and as a validator
- A transaction is initiated when a user (sender) inserts the details of a transaction in a specific interface provided by the gateway
- The transaction is encrypted with the private signature of the sender and can only be decrypted by the receiver
- The transaction is sent to the network, crosschecked with the ledger to verify its suitability and approved by consensus

Source: INNOVALUE analysis, Ripple website, Ripple conference

The use of smart contracts offers banks and businesses a high variety of applications, however they have not yet been adopted by FIs

Use cases of blockchain technology – Programmable money

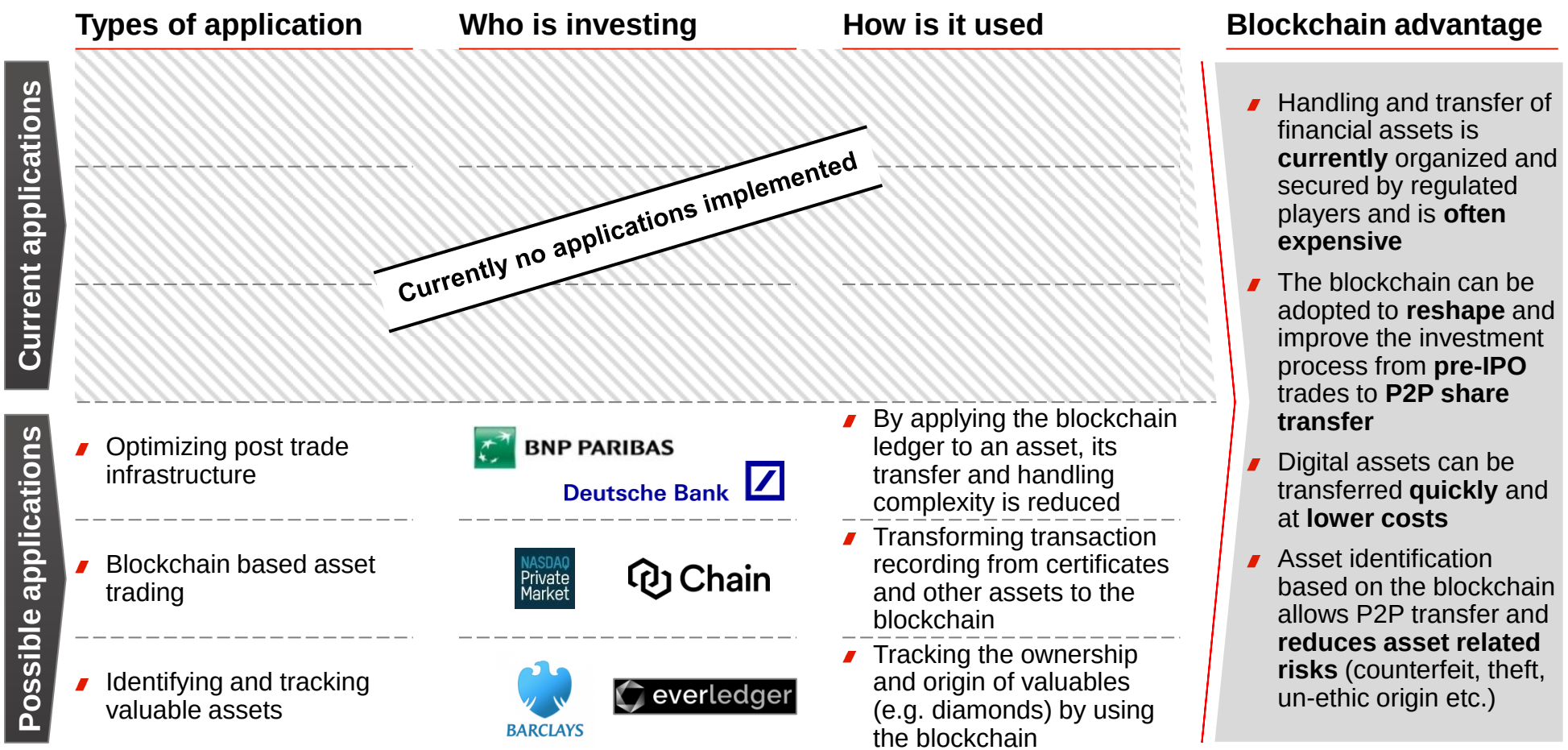
	Types of application	Who is investing	How is it used	Blockchain advantage
Current applications	Currently no applications implemented			
Possible applications	Automated clearing and settlement	Santander	Using smart contracts to automate clearing upon trade completion	
	Derivative trading	ABN·AMRO, Deutsche Bank	Improving the enforcement and clearing of derivative contracts through smart contracts	
	Smart contracts	SmartContract	Creating smart contracts so that payments and trades occur as soon as a specific criteria is met	

- **Traditional contracts carry** the **risk** that one party might not fulfil its obligation
- In a **smart contract** the **confirmation** that all conditions are met, is **generated automatically**, therefore coordination effort is reduced substantially
- Payments are only **committed once** and if all **conditions** are **fulfilled**
- The smart contract issued on the blockchain provides **full transparency** of the deal and **balance status of** the **parties**

Source: INNOVALUE analysis

Digital assets appear especially interesting for FIs in order to streamline trading activities and reduce related costs

Use cases of blockchain technology – Digital Assets



Source: INNOVALUE analysis

In fact, a variety of start-ups are putting into practice the conceptual applications of the blockchain to the financial and trading industry

Asset trading and trading finance

Asset trading

- The blockchain can be adopted to reshape and improve the investment process from pre-IPO trades to P2P share transfer

- Nasdaq partnered with blockchain company and API provider Chain to transform the recording of transactions from paper certificates and spreadsheets to the blockchain

- Symbiont enables the blockchain to be used to reduce the migration time of an asset from buyers and sellers and lower costs

Trading finance

- The blockchain can be adopted to reshape and improve trading finance dynamics

- SmartContract gives you the possibility to create smart contracts so that payments and trades occur as soon as a specific criteria is met

- Hedgy facilitate commercial trade execution and settle over-the-counter forward contracts with less counterparty risk

Source: INNOVALUE analysis, Coindesk.com, Nasdaq Private Market, Chain.com, Symbiont.com, Smartcontract.com, Hedgy.co

Though data storage could be decentralized when using blockchain technology, FIs have not yet realized such applications

Use cases of blockchain technology – Data storage and KYC

	Types of application	Who is investing	How is it used	Blockchain advantage
Current applications	Currently no applications implemented			
Possible applications	▪ Building a public / private data storage		▪ Data storage of details of cryptocurrencies based on blockchain technology	
	▪ Decentralized storing of client information		▪ Using blockchain technology to store client data and make it accessible to the internal network	
	▪ Decentralized record storing		▪ Record-keeping system, allowing information to be stored and accessed through a distributed ledger	

- **Client information** are currently **stored** most often in a **centralized** ledger – not accessible to everyone in the network
- The application of the **blockchain** can **increase** the **efficiency** of KYC procedures
- **Access** for authorized parties **to all files** can be implemented when using the blockchain technology
- Potential to **reduce** the **handling complexity** of files and fastens processes
- Significant opportunity to **of related cost reduction**

Source: INNOVALUE analysis

Optimization of KYC procedures using the blockchain is at an experimental phase

KYC procedures

Blockchain and KYC procedures

- The application of the blockchain to increase the efficiency of KYC procedures might still seem a utopian reality because of the early stage of the blockchain technology in this field
- The blockchain as at today struggles in managing high amounts of documents, pictures and all sorts of documentation required by KYC procedures
- However there are two proof-of-concept initiatives that are trying to implement efficient solutions to optimize KYC procedures:
  - Credits in the Isle of Man
  - ShoCard

Who is doing what

Credits

- Credits is a pilot project to create a register, stored on a blockchain, of all of the Isle of Man's cryptocurrency companies. Credits has been implemented using Pythia's protocol (a protocol developed on the Isle of Man)
- *"The network will be manned by 3 validating nodes within the department of Economic Development of the isle…whenever any two of those nodes agree on a block, then that block will be part of the blockchain. Anybody who connects to the network can audit and download the blockchain"*- Nick Williamson, CEO of Pythia.
- The Credits blockchain is a hybrid, combining private and public elements and therefore not all participants see the full state of the chain

ShoCard

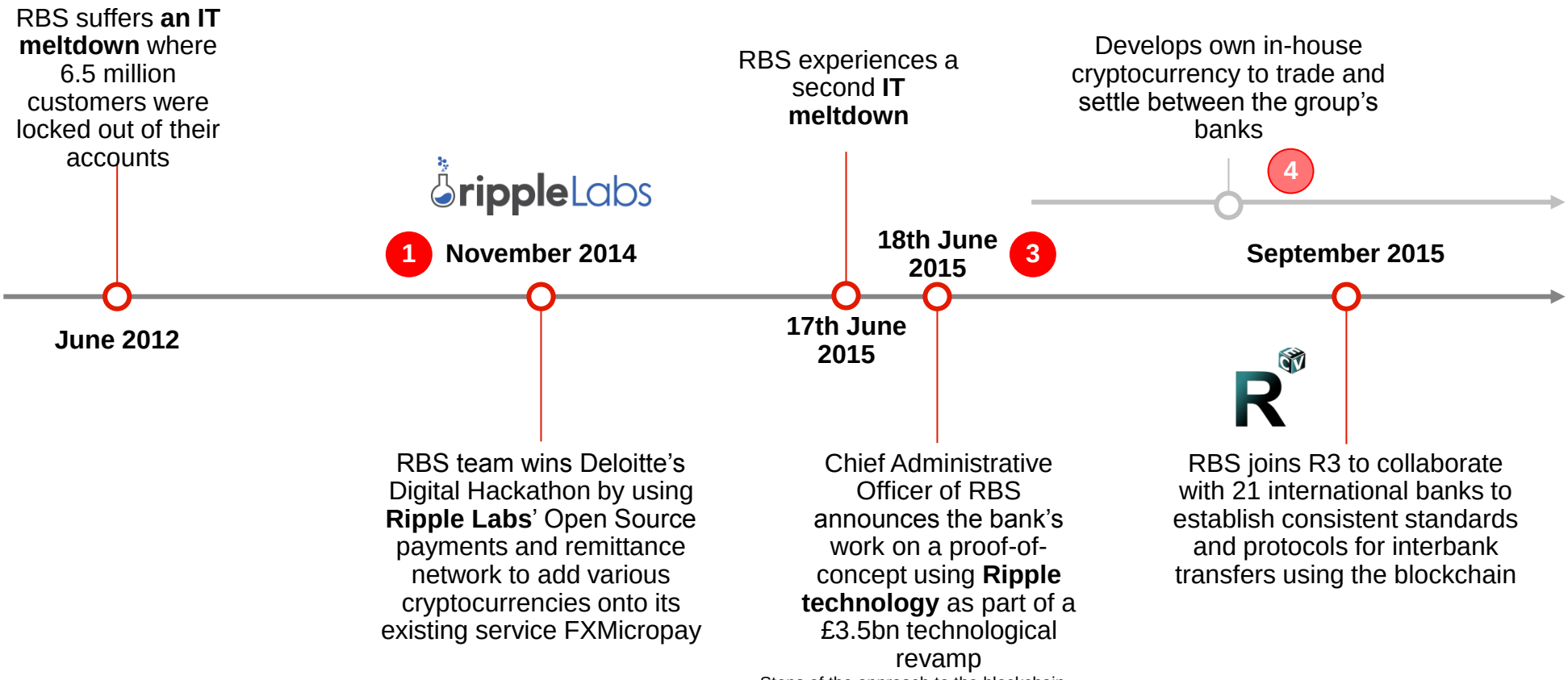
- Still in the experimental phase, ShoCard aims to function as a mobile ID that can be verified in real-time using a combination of cryptography and blockchain technology

Source: INNOVALUE analysis, Coindesk.com, ShoCard.com, Isle of Man Economic Development department

RBS, pushed by internal needs, has quickly integrated blockchain technology in its systems

RBS case study

RBS approach to the blockchain



Source: INNOVALUE analysis, Ripple official website, RBS official website, Coindesk.com

Steps of the approach to the blockchain technology and cryptocurrencies

Fidor strengthens its innovative reputation by being the first mover in implementing blockchain and cryptocurrency solutions

Fidor case study

Fidor approach to the blockchain

October 2013

Partner with Kraken to create a digital currency exchange in Europe

4

May 2014

rippleLabs 4

Fidor becomes the first bank to integrate Ripple's payment protocol, allowing its customers to instantly send money in any currency in any amount through the bank's money transfer products at lower cost

February 2015

Partnership with Bitcoin.de produces the first bitcoin trading platform with a "direct connection to the traditional banking system" (customer funds stay within their Fidor Bank accounts)

1 4

September 2015

- Fidor launches in the UK
- Still not part of R3

Source: INNOVALUE analysis, Ripple official website, Fidor official website, Coindesk.com

Steps of the approach to the blockchain technology and cryptocurrencies

There are a number of other organisations that are proofing, testing or in early development with blockchain technology …

Other case study

NON EXHAUSTIVE

Other approaches to the blockchain

UBS is experimenting with Smart bond applications …

NRI 未来創発 is testing blockchain application to securities trading …

JPMorganChase is exploring trading applications …

Rabobank is proof testing blockchain enabled KYC and document management …

RBC Royal Bank is proofing blockchain for remittances and loyalty programmes …

… while regulators are taking different views solely based on the virtual currency application of the blockchain technology

European Bank Authority (EBA)

- Believes virtual currencies should be regulated at European level to protect consumers, enhance financial stability and reduce risk of financial crime, recommending that:
  - National supervisory authorities discourage credit, payment and e-money institutions from buying, holding or selling virtual currencies
  - EU legislators declare market participants (e.g. virtual currency exchanges) subject to the EU AML Directive

European Central Bank (ECB)

- Virtual currency schemes (virtual/ digital currencies) have numerous potential risks, but the materialisation of these risks depends on risk drivers such as the volume of virtual currencies issued and traded, and user acceptance

US Govt.

- Regulation mainly aimed to Bitcoin
  - FinCEN[1] issued guidance on the applicability of regulations to digital currencies
  - NY Department of Financial Services (NYDFS) adopted BitLicense regulations for virtual currency businesses (2015)
- NY's BitLicense will have wider relevance and the full impact is yet to play out
  - Other states will look here for guidance on how to deal with digital currency services due to NY's importance as a financial centre and the lengthy consultation process
  - BitLicense release sets a precedent for other states who have been waiting to see its impact in the market

1. Agency who enforces the bank secrecy act

Agenda

1. INNOVALUE profile
2. Blockchain in Financial Services
3. Deep-dive on use cases
4. **Conclusions**

The blockchain is an innovative solution but is still on a journey to development (but already having serious implications for the financial services industry)

- The blockchain offers the potential to evolve from its initial launch as a niche applications (e.g. a digital currency) to potential large scale adoption by businesses and governments

- Technical modifications and improvements to its design would still need to be considered to address regulation, costs implications, technical challenges, etc..

- Organisations should be considering the potential implications and impact of the blockchain and the level of disruption it will have on them based on their industry, positioning and organisational maturity

- Companies should develop strategies and business models that leverage the blockchain as an enabler that can be core or complementary to their business

INNOVALUE Management Advisors Ltd.
3 More London Riverside
London, SE1 2RE

United Kingdom

For more information:

Francesco Burelli
Partner

Mobile +44 788 781 3003
Email francesco.burelli@innovalue.com