Project Dissertation Report on

LEVERAGING DISRUPTIONS BY BLOCKCHAIN

By

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CERTIFICATE

This is to certify that Shubhangi Garg, Roll No.:2K19/EMBA/545 student of Executive Masters of Business Administration (2019-2021) at Delhi Technological University, has accomplished the project titled **Leveraging Disruptions by Blockchain** under my guidance and to the best of my knowledge has completed the project successfully, for the partial fulfillment of the course in fourth semester of the course Executive MBA.

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DECLARATION

I hereby declare that the project entitled **Leveraging Disruptions by Blockchain** under the guidance of Dr. P.K. Suri submitted for partial fulfillment of degree of Executive Master of Business Administration from Delhi School of Management, DTU. This is my original work and this project work has not formed the basis for the award of any degree to the best of my knowledge.

Shubhangi Garg

2K19/EMBA/545
Place: DSM, New Delhi

ACKNOWLEDGEMENT

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EXECUTIVE SUMMARY

Blockchain technology is slowly making its way from buzz to adoption. Organizations are moving from the experimental/proof-of-concept stage to using the technology for certain business operations, which will likely be followed by more large-scale commercial adaptations as the technology matures and knowledge grows. Business process innovation will be a crucial driver of this transformation, and it is likely to disrupt the way services are delivered in a good way.

This process of adopting blockchain is marked by significant collaboration across all value chain actors, in contrast to the conventional approach, in which firms were known to compete with one another - where secrecy was the rule when it came to technology selection, launch plans, and even business strategies. Financial institutions, conventional technology corporations, fintech businesses, as well as regulators and governmental agencies, are all working together. To drive digital transformation of their organizations, companies will need to leverage the correct IT, infrastructure, and tools, as well as subject expertise and cooperation.

This research throws light on the use of blockchain technology in different areas. Here I have tried to examine different cases in various domains where the implementation of Blockchain technology can help in reducing costs and increase ROI. These cases come from clients who are facing challenges in their regular work and want convert the challenges into opportunities and be market leaders. This research is to study and analyze various case studies and suggest possible use of Blockchain to bring change and increase customer satisfaction. The research will also help TCS to harness the Blockchain technology and enhance skills of their workforce. Since Blockchain will keep influencing different sectors, it has become very prominent that companies need to bring about changes in their current functioning and channelize their resources to find out ways of using Blockchain technology.

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1. INTRODUCTION

The use of blockchain is at a pivotal stage. Enterprise leaders hear of its potential to revolutionize how businesses can work, and there is never a day without an announcement of a new blockchain proof-of-concept (PoC) or pilot or partnership. But as leaders dig deeper, they cannot articulate how exactly blockchain will impact their business, and there are no precedents that they can learn from either. This lack of clarity leads them to lose and light experimentation with blockchain for current processes. Loose experimentation is usually a good way to learn about emerging technologies but often inadequate. Executives should take a carefully thought-out approach with blockchain (Iansiti & Lakhani, 2017).

1.1 Objectives

To explore the impact of blockchain to different areas

- Understand importance and significance of blockchain

- Link use of blockchain to business needs and goals of TCS clients

- Mapping blockchain technology to business needs and business problems.

- Create relationship between learning outcomes with particular business benefit.

1.2 Overview of Blockchain

Blockchain is a continuously growing list of records, called blocks, which are linked and secured using cryptography. Each block typically contains a cryptographic hash of the previous block, a timestamp and transaction data. By design, a blockchain is inherently resistant to modification of the data. It is "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way." (Iansiti & Lakhani, 2017)

Blockchain was invented by Satoshi Nakamoto in 2008 for use in the cryptocurrency bitcoin, as its public transaction ledger. It is a system that you can add data without

changing any pervious data within it. The data added previously remains intact. It does this through a mechanism of creating consensus between scattered or distributed parties that do not need to trust each other but trust the mechanism by which their consensus is arrived at.


Fig 1.1 Evolution of Blockchain (Source: Based on Internal Project data)

Blockchain is essentially a permanent and immutable record of transactions within a network, root of the blockchain are digital ledgers which are distributed across all the participants within that network.

When there is a transaction, it gets recorded in that digital ledger in sequential manner. Later these blocks are packaged as part of blockchain.

First implementation was Bitcoin Blockchain.

Blockchain eliminates intermediary in centralized business and help to develop solutions for decentralized business models.

It is continuously growing with growing list of records or transaction. Blockchain using p2p network and is a decentralized and public digital ledger that is used to record transactions across many computers (Voshmgir, 2019). So that the record cannot be altered. There is no server and all data are stored in every computer. So, there is no easy target for hackers.

1.3 Working of Blockchain
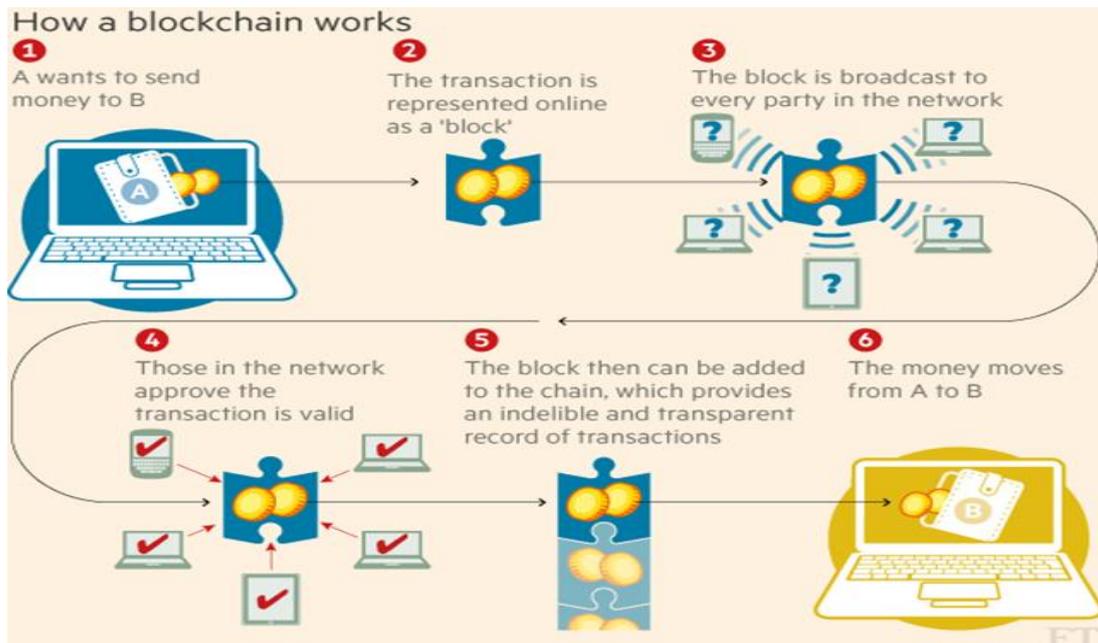
Figure 1.2 Working of Blockchain (Source: Financial Times, https://www.ft.com)

To understand blockchain we need to know following 4 terms such as Block, p2p, cryptographic hash and miner.

Block

Each block can contain following elements.

1. Index no: Serial no of the block.

2. Timestamp: Time the block got generated.

3. Transaction data: Data about transaction. There can be multiple records per block.

4. Current block hash**:** The cryptographic hash code (SHA256 algorithm) of the current block generated by taking all the information present in the block. The hash code generated by SHA256 is totally unpredictable.

5. Previous block hash: Each block keeps the previous block's code to make the chain grow. The first block set this property to zero as first block don't have previous block.

6. Target: This is a hexadecimal number set by Proof of work algorithm.

7. Nonce number: This property is for miner to keep changing and get a right hash code. The right hash code should be less than the target set by algorithm.

Peer-to-peer(p2p)

In p2p network, there will be no centralized server. Each computer is connected with each other. All transaction details will be store in every computer and each computer is known as node.

Cryptographic Hash

This hash code is 64 characters long hexadecimal number. Which is got generated using SHA256 algorithm. A Very small change for example dot or space in block will change the whole hash code completely.

Miner

In blockchain network, some nodes are known as miners. They have some additional tasks. They are trying to add the new block to the blockchain. Miners keep on changing the Nonce number to get hash code less than target. Once he gets the hashcode less than target, the block is complete.

Working

There is no centralized server. So, blockchain get store in every computer. Suppose one user sent a transaction request. This information will broadcast to every node. So, every node will verify the transaction. Suppose you have 5-bit coins and you are trying to send 7-bit coins, which is not valid. So, this will be verified and cancel by all nodes. For valid transaction, it will be written to the block. It keeps on adding the valid transactions in the block. A block contains multiple transaction records. In the meantime, if miner got a hexadecimal code lesser than the target, then the block is complete and get added to the chain and each nodes blockchain get updated.

Sometime multiple miners get the required hexadecimal number at a time. In that case it will not add any minor's block to blockchain but keep that block aside. To handle this kind of conflict situation the blockchain will wait for next block to be generated.

Now whoever created the next block first, that miner's previous block and new block got added to the blockchain and updated in every node's blockchain.

Security

If a hacker tries to modify any block's transaction in any node, even for a single letter change the whole hash code of block get change completely and it will break the link to the next block as every node storing the previous node's hash code. The other nodes in the network keep checking each other and if they found any mismatch, it reverts back the modification done by hacker. So, for hackers it is a nightmare to into a blockchain.

1.4 Attributes of Blockchain

Decentralized- validation in blockchain – As the new data is packed into blocks that can only be added to the blockchain after consensus is reached on the validity of the action, e.g., a ticket seller is the legitimate owner of a ticket.

Redundancy- Blockchain continuously replicates on all or at least a group of nodes in the network. As a result, no single point of failure exists.

Immutable storage- In case of blockchain each stored block is linked to its previous block in the chain, making it almost impossible for hackers to subsequently change blocks, as they would have to manipulate any succeeding block plus the majority of their replications.

Smart Contract – Immutable business logic/code, which will run as programmed every time consistently, and will not able to replace it with out every network members consensus

Security- All the digital signatures based on pairs of cryptographic private and public keys put network participants in a position to authenticate which participant initiated a transaction, owns an asset, signed a (smart) contract, or registered data in the blockchain

2. LITERATURE REVIEW

2.1 Companies using Blockchain

Table 2.1 Companies and their way of using Blockchain

Company	Project
CoinBase	➢ CoinBase has filed patents for most of the aspects of the Bitcoin marketplace, including: Hot wallet for holding bitcoin, User Private Key Control, Bitcoin Private Key Splitting for Cold Storage, Instant Exchange, Personal Vault, Send Bitcoin to Email address, Bitcoin exchange, Tip Button, Off-Blockchain Transaction in combination with on-Blockchain transactions (Riley, 2015)
World Economic Forum	➢ By 2025, 10% of global gross domestic product (GDP) will be stored on blockchain technology (Ogee & Guinard, 2019) ➢ By 2023, Tax collection by government using Blockchain
Digital Asset Holdings	➢ **Digital Asset Holdings** is a blockchain technology company that provides settlement and ledger services for financial assets. Founded in 2014. Led by ex-JP Morgan Executive. (Hackett, 2016) ➢ In June 2015 it acquired blockchain technology companies Hyperledger and Bits of Proof. ➢ In October 2015 it acquired the blockchain technology company BlockStack. ➢ Raised more than $50m in a fundraising round, which included JPMorgan, BNP Paribas, ABN Amro and Santander. ➢ Goldman Sachs Group Inc. and IBM invest in Digital Asset Holdings, (Feb 2016)
NASDAQ	➢ Launched Oct 2015 - Nasdaq Linq is a digital ledger that leverages a blockchain to facilitate the issuance, cataloging and recording of transfers of shares of privately-held companies on The NASDAQ Private Market (Ludwin, 2015)
Euroclear	➢ Post-trade settlement specialist Euroclear along with consulting firm Oliver Wyman has published a report on how blockchain could eliminate delays and inefficiencies in capital markets (Wyman, 2016)
DTCC	➢ Investing in the blockchain start-up led by Blythe Masters and joined HyperLedger project (NEW DTCC WHITE PAPER CALLS FOR LEVERAGING DISTRIBUTED LEDGER TECHNOLOGY TO SOLVE CERTAIN LONG-STANDING OPERATIONAL CHALLENGES, 2016) ➢ Has formed an "Office of Blockchain Strategy and Research" ➢ At the end of March 2016, plans to host a blockchain symposium that will include leading experts from the industry, academia, government and vendors. ➢ Proposes use of blockchain in whitespaces where automation is limited - syndicated loans or other parts of the securities processing world, such as corporate actions and mortgage-backed processing. ➢ Believes that its role [as market structure providers] will evolve – as the outcome is not going to go to a completely permissionless, non-centralised world.

Capital Market Startups	➢ Startups like SETL, Symbiont and Digital Asset Holdings are angling to siphon volume from firms like DTCC which clears $1.6 quadrillion annually.
SETL	➢ The institutional payment and settlement infrastructure based on blockchain technology, claims to have which has broken the 1 billion transactions-per-day capacity barrier for blockchain movements in a test network (Future, Fintech, 2015) ➢ In discussion with more than 40 financial institutions including leading banks and infrastructure providers to create a cross-industry solution. ➢ The SETL system is designed with financial markets users in mind and will enable market participants to move cash and assets directly between each other, facilitating the immediate and final settlement of transactions.
Nomura, Japan	➢ Japan's top think tank studying block-chain technology for its securities sector ➢ Practical applications expected after the study is completed in Jan 2016
JP Morgan	➢ The biggest US Bank by assets - begun a trial project using blockchain as it seeks to lead banking-industry efforts to cut the cost and hassle of trading (Asset, 2016). ➢ Collaborating with Digital Asset Holdings and part of Linux foundation Open Ledger project ➢ Looking at several applications for the technology, including addressing liquidity mismatches in JPMorgan's loan funds, which normally let investors take out their money at short notice — even though the underlying assets can require much more time to sell. ➢ JPMorgan appears to be taking a lead in encouraging broader, industry-wide adoption of blockchain technology
Bank of England	➢ The central bank of UK says distributed Ledger aspect will play a key role in Bank of England's mission of maintaining financial and monetary stability, while also making the world a better place for everybody involved. ➢ Currently undertaking work to understand the implications of new digital or e-monies and new methods of payments and financial intermediation as part of its One Bank Research initiative (Finextra, 2016) ➢ Conducted a contest for receiving ideas on blockchain – with the prize including a 6 week internship (Finextra, 2016)
Bank of America	➢ Bank of America has already filed for 15 blockchain-related patents and is currently in the process of drafting another 20 to be submitted (Kharpal, 2016) ➢ Bank of America patents published by the USPTO include proposals for a "cryptocurrency risk detection system" and "suspicious user alert system" among others.
USAA	➢ Says "blockchain technology is a game changer" – "something as big as the Internet" ➢ Examining how blockchains could potentially decentralize its operations (e.g., back office) ➢ Has no plans to adopt bitcoin as a currency.
Samsung	➢ Joined with IBM in ADEPT to showcase NextGen IoT; ➢ Samsung investing heavily on "Filament" that focuses on Decentralized IoT Software Stack
VISA	➢ With DocuSign has unveiled a PoC that cuts paperwork out of Car leasing ➢ Sees BlockChain as "the next big thing". ➢ Innovation Labs – including the one in Bangalore, India – working on BlockChain Experiments.

	➢ Various partnerships and investments ongoing.
Citi Bank	➢ Working on its own cryptocurrency – CitiCoin ➢ Claims to be running three separate systems within Citi that deploy blockchain ➢ With Visa and Nasdaq, investing heavily on Chain.com – BlockChain Enterprise Platform (Shin, 2015)
Barclays	➢ Has two blockchain Labs – with over 45 experiments ongoing ➢ Published WP on Understanding BlockChain Potential ➢ Partnership with BitCoin exchange, BlockChain startups etc.
BNP Paribas	➢ Forecasts two scenarios: "total disruption or doom" or new, improved services for the institutions who handle the world's trades. ➢ Looking to add BitCoin to one of its currency funds. ➢ Collaboration with Digital Asset Holdings and member of R3CEV. ➢ Hosted BlockChain Tech Development Event
AXA	➢ Looking to use BlockChain in remittance Market to cut ongoing expenses. ➢ Researching potential uses for blockchain in insurance, real estate, wealth management and intellectual property. ➢ Has created Kamet, a €100m InsurTech incubator dedicated to conceptualizing, launching and accompanying disruptive products and services.
UBS	➢ Created BlockChain Research Lab in London (Apr 2015); working with R3 Consortium; ➢ Experimenting with "smart bonds" and "instant settlement" – lower costs and risks. ➢ Building "utility settlement coin" linked to real-world currencies and central bank accounts. ➢ Collaborating with blockchain startup Clearmatics. ➢ Working with BNY Mellon on other block chain initiatives.
PayPal	➢ Allows merchants to accept bitcoin for digital goods using PayPal Payments Hub ➢ Enabling vendors like Airbnb rentals, eBay and Uber to accept Bitcoin (using BrainTree) ➢ Sees BlockChain mass adoption as "several years" away but has potential ➢ Appealed for regulatory clarity between bitcoin payments and blockchain applications.
Telecom	➢ Telecom giant Orange is having talks with bitcoin / blockchain start-ups and supplies money for investments. DoCoMo, T-Mobile and Perseus Telecom are also investing in BlockChain. ➢ "*There's something intriguing in this, so we want to be there as early as possible.*"
UNICEF	➢ Blockchain technology could provide a solution to issues facing the world's impoverished children - UNICEF innovation. ➢ Has launched an innovation venture fund to invest in it (Feb 2016) ➢ Use of the blockchain technology as a means to provide a form of identification – "if you don't have access to an identity and you're a child and you're in a war zone, you're most likely to be trafficked or hurt".

(Source: [(Blockchain is not a magic bullet for security. Can it be trusted?, 2019), (Bank of America is going big on blockchain, 2016), (SETL breaks through 1 billion transactions per day on blockchain, 2015), (Pure evil: Coinbase moves to claim ownership of the Bitcoin market with various patent filings, 2015), (Bank of England to develop blueprint for overhaul of UK payments system, 2016) (Visa, Citi, Nasdaq Invest $30 Million In Blockchain Startup Chain.com, 2015)])

2.2 Technology or Service Companies working on Blockchain

Table 2.2 IT Service companies and their project on Blockchain

Company	Project
IBM	➤ ADEPT PoC to showcase IoT with BlockChain with Samsung and ADCAST. ➤ IBM With UK Govt, funded Innovate Finance, blockchain lab ➤ IBM associated with conducting the HackCoin Hackathon at Mumbai, the first hackathon focused on bitcoin and bitcoin-based application in India. ➤ Introducing a new Blockchain-based protocol specially designed for smart contracts.
Microsoft	➤ With MIT exploring unique BlockChain applications – Civic Infrastructure, Identity Storage. Internally exploring BlockChain for IoT ➤ Partners with ConsenSys to use Ethereum to provide Blockchain-as-a-Service! ➤ The existing partners in the Microsoft Azure BaaS ecosystem includes ConsenSys, Ripple, Eris Industries, CoinPrism, Factom, BitPay, Manifold Technology, LibraTax and Emercoin.
Deloitte	➤ Deloitte has launched Rubix platform that allows clients to build apps on blockchain IS ➤ Seeking to use blockchain technology to automate client auditing (internal) and crowdsource its consulting efforts; "a blockchain-based audit system is the future of accounting". ➤ Dedicated Deloitte Cryptocurrency Community, with about 100 members in 12 countries. ➤ Deloitte is working on more than 20 use cases for the technology – for itself and its clients. ➤ Partnership with Coloured coins startup Colu. ➤ Sponsoring (with Fidelity Investments & Citi) BlockChain Hackathon in Ireland (Nov 2015)
Accenture	➤ States that "Blockchain Has Great Potential, Currency Needs to Go" ➤ Plans to Leverage the Blockchain Technology In Corporations And Financial Markets. ➤ Published a white paper called *Blockchain in the Investment Bank.* ➤ Struck an alliance with Ripples *As part of the deal, Accenture will integrate Ripple's products in its advisory services to clients.*
PwC	➤ PwC has started an aggressive blockchain-based fintech development program and recruited 15 technology specialists to explore the application and commercialization of the blockchain technology ➤ PwC's Blockchain Solution Portfolio website. ➤ PwC Partners with Blockstream and Eris Industries to Create Blockchain Solution Portfolio (Jan 2016) ➤ PwC analysts see three trends related to blockchain that they believe will be important in 2016: Companies will need to protect their intellectual property as they explore new collaborative opportunities with customers, suppliers and competitors; large financial institutions will need strategic plans to set parameters for technology risk-taking; and market participants will start to develop the processes that surround the transactional layer.
CapGemini	➤ CapGemini Sogeti Labs actively researching the BlockChain - "Design and Disrupt"

	➤ CapGemini team won 2ⁿᵈ prize in organized by Bombay Stock Exchange ➤ Payments CoE working closely with client and technology partners. ➤ In Sep 2015, launched its own SRTCoin (Satoshi Roundtable Coin) with the aim to experiment, test and learn about crypto-currencies.
Infosys	➤ In April 2015, announced the integration of blockchain into Finacle (core banking software). ➤ Building in-house expertise (with around 20 members in Bangalore and Palo Alto offices). ➤ Developing a partnership with other players in the blockchain ecosystem. ➤ Expected to invest or partner with startups in blockchain. ➤ **Blockchain University** conducted a week-long workshop at **Infosys's** Mysuru training facility (Aug 2015)
Cognizant	➤ WP on "The Changing Face of Payments 2015" - the blockchain has become the third highest active force for change behind mobile and alternative payments ➤ Working on building payment and settlement system solutions using blockchains. ➤ Associated as partners, or as a sponsor, for events from blockchain related startups.
TCS	➤ TCS has been working on Blockchain technology for over a year now. ➤ According to a senior executive from TCS on one of the Indian business magazine — People think Blockchain is all about Bitcoin, which isn't true. Blockchain can disrupt the model of every single industry we can think of, even Airbnb and Uber. ➤ Blockchain eliminates middlemen and decentralizes business. ➤ TCS is looking forward to offer Blockchain based solutions to capital markets for securities trading without involving the central clearing house.

(Source: [(IBM Blockchain Services, 2021), (Microsoft and mit explore unique applications of the bitcoin blockchain, 2015), (Will Another Bitcoin Firm Excel At Accenture' FinTech Innovation Lab London?, 2015), (Blockchain is here. What's your next move?, 2018), (Blockchain in Capgemini, 2018), (Infosys to re-engineer Finacle, revamp compensation structure, 2015)])

2.3 Blockchain happenings in TCS

Table 2.3 TCS Capitalizing Blockchain Technology

TCS Groups	Brief on what they are doing
CTO	✓ Believe that BlockChain technology has great possibilities ✓ Focusing on the crypto aspects and finding alternatives to make it work in Enterprises ✓ Identifying Innovative Use Cases ✓ COIN exploring startups in BlockChain
BTG	✓ Where the most action is today! ✓ Most BFS customers showing interest and joint exploring being planned ✓ Working on creating alliances with niche vendors ✓ Have an inhouse built PoC platform with four PoCs implemented
BANCS Product	✓ In BANCS research journal (Oct 2015) published an article on "Blockchain in Financial Services – A Catalyst for Simplification"; Also blockChain impact on Capital Markets

Capital Markets	✓ *Published WP BlockChain transforming Capital Markets* ✓ *Tracking whats happening – Nasdaq, SETL, T2S (EU), NSDL etc.*
BPS – TSG	✓ *In their WP – "Banking as we don't it know it yet" mention "with blockchain that will be widely used, full history of banking transactions for each customer will be available to all nodes in the block chain"*
Ignite	✓ *Developed IgniteCoin – a local implementation of BitCoin* ✓ *PoC to using TimeStamp in BlockChain to establish IPR*
GCP Research	✓ *Detailed Research on what various players do:* *(1) Abra, Xapo, Red Rose, BitsPark… (crypto currency)* *(2) Digital Asset Holdings, Ethereum, BlockStream (side chain)… - BlockChain platform and technologies* *(3) Nasdaq, Visa, Taringa (users of BlockChain)*
GCP Banking	✓ *Focusing on NextGen Banking – working closely with BTG and connecting with customers* ✓ *Participated in Consensus Conference 2015* ✓ *Discussion with USAA Executives and Harland Clarke (Jan 2016),*
GCP IO	✓ *BlockChain University Course, NextGen* ✓ *Connect with BTG, GCP Banking and clients* ✓ *Learning, exploring, connecting, collaborating!* ✓
Non BFS TGs	✓ *Seem to have ignored BlockChain so far – as a CryptoCurrency stuff* ✓ *Expected to show some interest early next year with platforms getting concrete*

(Source: TCS Internal Data)

3. RESEARCH METHODOLOGY

3.1 Qualitative Analysis

In this study qualitative approach is used to work on the objectives. Qualitative Research is primarily a type of exploratory research in which our focus is on gaining an understanding of the underlined reasons, motivations and opinions. It will provide us an insight into the kind of problem or will help to develop ideas or the hypotheses for the potential or upcoming quantitative research. Qualitative Researches are also used to discover the trends in he thought and opinions, and to dive deeper into the problems. Qualitative data collection methods change with unstructured or semi-structured techniques. Some of the common methods include case studies, focus groups (group discussions), individual interviews, and participation/observations. The method adopted here by understanding and analysing different case studies which will examine the in-depth purposive samples to understand the phenomena. The case study method will cover details and context used with smaller focused population.

3.2 Source of data

To collect data, secondary sources are used.

- Secondary Sources: TCS customers and clients, discuss with them, and analyse caselets on how digital technologies impact and create value addition.

4.0 CASELETS

Based on the understanding developed through research and literature review, different business scenarios are studied to know the influence of blockchain on business of TCS clients.

Caselet 1: Blockchain for Announcements

Business Scenario
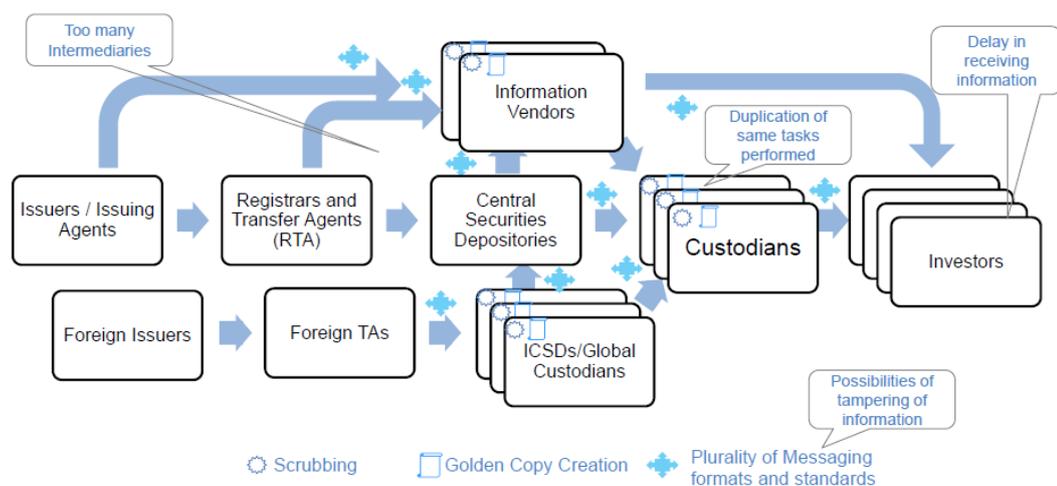
Figure 4.1 Business case on working of announcements and their loophole (Source: TCS Internal data)

Suggested Role of Blockchain

When all the entities are in a block chain, the announcements are instantly available to all other entities from the true source

- TCS has developed a Blockchain based Distribution Platform by which Multiple parties in the Bank can receive the Scrubbed Corporate Actions Announcement Instantaneously. The Scrubbing engine will be coupled with Blockchain platform to provide seamless Golden announcement information to multiple systems/parties including client's real time.
- A Bank which is a local custodian in multiple markets will have the advantage of having the data available within its ecosystem as soon as the market has it,

and that can be leveraged for global distribution using Blockchain.

- An ecosystem of Announcements can be created catering to a specific Market/Region. It is expected that major participants of that region are part of this Announcement Ecosystem.

- Golden Copy of Announcement will be created based on Pre-determined Rule Set /Processes of Confirmation/Consensus agreed by participating entities

- The Block chain-based Announcement Ecosystem will be able to distribute the Announcement information instantaneously among all participating Nodes (Quartz Gateway) and can expose the information only relevant to the participating entity

Expected Benefits

Disruptive change to the way Announcements is distributed

- Instantaneous availability of Announcements information
- Eliminates Messaging
- Single Source of Truth – Tamper Proof
- No need for reconciliation – same data available at all ledgers
- Less complex. No transformation as data is retained as received
- High availability in case of node failure; information will still be available in
- other nodes

Caselet 2: Reimagining Settlement on Blockchain

Business Scenario

- Move towards shorter Settlement cycles
- Reduce Settlement risk, collateral demand from participants
- Remove dependency in processing between entities.

Suggested Role of Blockchain

- Re-imagine Settlement processing
- Create an eco-system which allows all stakeholder to a transaction to be members on the Blockchain

- Real-time instantaneous settlement

Expected Benefits

- Instantaneous Settlement
- Reduction in Risk
- Simpler Reconciliation
- Real-time Holdings view
- Elimination of Messages

Caselet 3: KYC using Blockchain

Business Scenario

- Ensure compliance with Regulatory directives requiring KYC validation of all client data
- Need to improve customer experience – avoid KYC process duplication across firms
- Regulatory drive to centralize KYC (cKYC) e.g. Industry bodies such as SWIFT and DTCC, legislation in India.

Suggested Role of Blockchain

- Fundamentally change the way Investor Information is managed
- Bring about disintermediation in KYC processing, ensure real-time access to investor data
- Disruptive Innovation – simplify processes and improve customer experience

Expected Benefits

- Automatic KYC Revalidation
- Data Consistency across firms
- Real-time Info updates
- Better Risk Management

Caselet 4: Employee Loyalty Program

Business Scenario

- Satisfied employees perform better.
- Employee loyalty programs are thus focused on improving employee engagement and retention
- But such programs fail to realize their full potential due to
  - Unclear program benefits
  - Time delays
  - Insufficient incentives
  - Frauds, errors
  - Limited redemption options
  - Low Return on Investment
- An ideal program would provide employees with real-time benefits, while keeping the costs down for program providers

Suggested Role of Blockchain

- Blockchain-powered loyalty solution
- One digital wallet for all partner vendors to credit rewards into
- Centralized from a consumer perspective, while decentralized from loyalty providers' perspective
- Easy add and drop of program partners and vendors
- Interlinked loyalty programs, with no intermediaries
- Transparent program management -reporting and tracking of event

Expected Benefits

For Customer

- Faster accumulation of points
- Instant redemption
- More service providers
- Seamless experience

For Loyalty Providers

- Cost savings
- Fraud proof
- Improved ROI
- New business opportunities

Caselet 5: Blockchain in Claim Management

Business Scenario

If a death occurs in a hospital, they will enter details of the deceased into the hospital records and claim is generated through insurer.

Suggested Role of Blockchain

- IT systems in that hospital can be integrated with the blockchain network. The deceased's information is entered onto the hospital's record, the information would be passed on to the blockchain network.
- Blockchain would ensure that data is recorded using cryptographic & hashing techniques.
- This information is retrieved and processed proactively using smart contract by an insurer to check for a possible insured match in the company.
- Insurer intimate's beneficiary and requests selection of funeral home through a customer portal
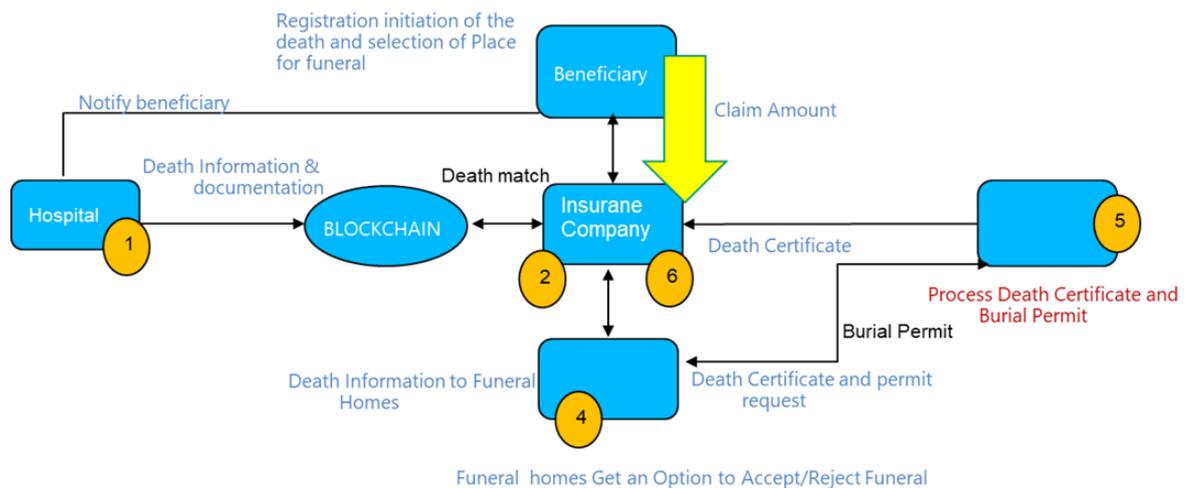
Figure 4.2 Role of Blockchain in Claim Management(Source: TCS Internal data)

Expected Benefits

- Real time information
- Better claim management.
- Fast and efficient setup

Caselet 6: Fraud Detection and Prevention using Blockchain

Business Scenario

The customer requires a New age digital Experience for their high net worth clients of investment banking division. The digital experience includes customer specific - Financial news, portfolio analysis, stock market trends on digital TV, smooth conversational system to look for specific stocks, intuitive recommendation to Buy/sell the stocks.

Suggested Role of Blockchain

- Blockchain using public ledger across the multiple trusted parties can eliminate errors and is capable to detect errors and fraudulent activities.
- With the help of decentralized digital repository which can help to independently verify the authenticity of customers, policies and transactions (such as claims) by providing a complete historical record.

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- Insurers would be able to identify duplicate transactions or those involving suspicious parties.
- Payments across borders and transactions involving multiple currencies related frauds and risks can be handled.

Expected Benefits

- In specialty insurance and reinsurance markets, where insurers are often removed from the end clients, blockchain may be used to address the considerable inefficiencies, gaps and errors caused by poor data quality in both front and back offices.
- Confirm subsequent ownership and location changes.
- Prove date and time of policy issuance or purchase of a product/asset

Caselet 7: Product Development and IOT

Business Scenario

- The amount of data being connected to IoT to the devices are rising.
- Data collected from these devices are of value to the Insurer as it will help them to come with new models and new products such as new Usage based models (UBI)
- For instances in the case of Auto insurance the encrypted data gathers from users based upon their deriving which can be the speed, distances travelled, places covered, and other factors can be pivotal to give and access risky drivers. This can then be helpful to come with their profile and proper premium to such consumers

Suggested Role of Blockchain

- As volumes of data are available, using blockchain large and complex data management more effectively. As in future the devices themselves will be capable to manage, handle and process the data.
- This will save the investment on the large data center that are maintained which

are most costly and require lot of maintenance.

Expected Benefits

- Save insurance agent/broker effort in quote review
- Enable better customer experience with easy quote comparison
- Quick and easy to use UI to view automated attributes extracted

Caselet 8: Data Privacy and Monetization

Business Scenario

As Data Owners today have no visibility into their data journeys and end usages, there needs to be a transparent system that gives back control of data to the owners by enforcing data privacy decisions and negotiating monetization options in a data marketplace.

Suggested Role of Blockchain

- A platform that enables Customers to monetize their own personal data while enforcing their own terms of usage
- Data usage terms to be defined and regulated through Smart Contracts
- Visibility into data journey to the data owner and allowing actions against violations
- Instantaneous & transparent payment settlement between data requestor and owner facilitated by CSP.

Expected Benefits

- A data and science driven approach to quickly identify the articles in real time manner
- Overall processing time of recommendation in 2 hours as against a day

Caselet 9: Universal E-health Record Manager

Business Scenario

The health industry needs a transparent, immutable universal ledger to form a data corpus for taking data driven medical decision for enhanced medical care and realizing Intelligent IoT medicinal solutions

Suggested Role of Blockchain

- Digital Identity maintained for all stakeholders
- Health records shared by patients, smart health assets, health service providers, medical practitioners stored in Blockchain
- Data usage terms to be defined and regulated through Smart Contracts by the Data Owner and transparently audited
- Stakeholders participate in Blockchain to exchange information against access tokens and trade data value enabled by native currency of the Blockchain

Expected Benefits

- Comprehensive
- Immutable
- Secure medical record ledger

Caselet 10: Ledger for Smart Ecosystem

Business Scenario

With billions of devices (things) connecting with each other to do independent data & monetary transactions, there is a need for decentralized smart contracts for transaction rules and an accountable decentralized immutable ledger for book-keeping.

Suggested Role of Blockchain

- Smart devices will transact with each other as per business rules defined and securely stored in smart contracts across Blockchain nodes
- Contracts define transaction paths and limits for smart devices
- No single party can alter the contracts
- Each transaction between devices will be stored immutably in the Blockchain based ledger
- This ledger can be audited for any security and privacy violations hence making all participants in the smart ecosystem accountable for their actions

Expected Benefits

- Stable system and efficient working
- Independent and immutable

Caselet 11: Social Collaboration for Energy

Business Scenario

As value & asset sharing (e.g., locally produced solar energy) becomes N-Dimensional, there is a need for a smart contract controlled, decentralized platform for exchanging value/asset (e.g., solar energy) among peers and smart metering of usage to drive monetization of those assets

Suggested Role of Blockchain

- A decentralized platform to tokenize assets (such as solar energy)
- Initially the assets belong to the producer and ownership is tagged to her
- Decentralized platform enabled by Blockchain enables negotiations and payment agreement between producer(s)/supplier(s) and consumer(s)
- Asset is tokenized and access token is passed to buyer/consumer who uses this token (with terms of usage defined in underlying smart contract) to access asset (energy)
- Asset (energy) utilization is accounted and metered through smart contracts

and Blockchain and billed

Expected Benefits

- Payments and settlements in real time either through crypto-currency or others asset exchange of value

Caselet 12: Digital Identity Protocol

Business Scenario

- Significant cybersecurity risks from compromised identities & IoT devices (client is one of the larger DDOS targets globally)
- Recent FCC rulings require customers to control their personal data at all times disallowing 3rd party usag without prior permission

Suggested Role of Blockchain

- Digital Identity protocol for people & things
- POC on our industrial internet platform with mobile, Zero-Knowledge verification app
- Feasibility of Blockchain-based private, user controlled yet Blockchain agnostic Digital Identity
- Combined multiple Blockchain & cryptographic technologies and decentralized Big Data solutions

Expected Benefits

- Feasibility to fulfill FCC privacy requirements
- Feasibility to use digital identity for authentication to avoid hacks and DDOS attacks
- Enables client to pursue new business models as identity and personal data advisor or manager

Caselet 13: Peer to Peer (P2P) Energy Trading

Business Scenario

P2P Energy Trading between Producers and Consumers without using the Grid is threatening to disrupt incumbent utilities

Suggested Role of Blockchain

- Collaborated with GE Digital leveraging Beta Blockchain service on GE Predix IoT platform
- Demonstrated new business model through set of simulated consumers settling their demand through Blockchain directly with producers.

Expected Benefits

- Proved technical feasibility of a new, disruptive business model for P2P Energy Trading between Producers and Consumers
- Showed how to maximize the returns for producers in this new business model

Caselet 14: Blockchain in Payroll Management

Business Scenario

- Cross-border HR Payroll involves mass payouts on a recurring basis
- Cost of bank transaction charges are too high for mass payments
- Current channels such as Western Union are inefficient and uneconomical for recurring mass payments
- Current process of advance payments to banks blocks he capital
- There are delays in wage payments across geographies
- Process of wage payment to contracted labor is not streamlined

Suggested Role of Blockchain

- Combining blockchain with mobile and cloud technologies, this solution

leverages smart contracts amongst staffing companies

- It facilitate a seamless process of real-time wage payments in local currency to cross-border workforce
- Staffing company computes payroll based on verified timesheet from client, multiplying clocked hours by agreed billing rates
- Staffing company communicates wage amounts to banks in terms of blockchain units, and bank pays the associates in local currency
- Payroll payments are settled with client based on units paid

Expected Benefits

- Cost of wage payment cost in terms of as bank transaction charges is reduced

- No capital is blocked in terms of advance payments to bank

- Secure, immutable transactions on blockchain for seamless settlement of accounts amongst clients, staffing company and banks

- Near real-time payments unfixed intervals across geographies

- Scope for leveraging crypto-currencies in near future with their rising trend

Caselet 15: Integrated Securities Markets & Investment Management & Insurance

Business Scenario

Public and private securities markets will be disintermediated by blockchain-based platforms that settle in real time and remove the need for exchanges, brokers, custodians and clearinghouses

Suggested Role of Blockchain
Launch either alone or in conjunction with others:

- Blockchain-based platform for trading publicly-traded and privately-traded securities, using colored coins on top of blockchain ledger
- Investments and all account management transactions based on Smart

Contracts and Zero Knowledge Proof identity validation

- Links to AI-supported or other Robo-Advisors and P2P markets, plus eventual links to Insurance and other products

Expected Benefits

- Low cost

- Speed (T=0 vs. T+3 settlement)

- Automated execution of actions based on pre-defined rules

- Secure, stable, accessible record, visible to users but anonymous to others, complete audit trail

Caselet 16: Private Wealth Management on Top of a Blockchain

Business Scenario

As cryptocurrency investments and smart securities become popular, one can deploy a Blockchain-based trading platform to enhance customer experiences by making its internal processes more efficient, safe and secure while remaining in compliance with regulatory requirements

Suggested Role of Blockchain

Launch either alone or in conjunction with others:

- Blockchain-based platform to enable its clients to trade assets and securities while remaining anonymous
- Platform in compliance with regulations (KYC, SOF, ALM) through Smart Contracts and Zero Knowledge Proof identity validation
- Platform enables better customer Experiences by introducing new tools and services, e.g., reputation, auctions, repackaging of securities for hedging purposes, etc.

Expected Benefits

- Low cost, speed, ease of use

- Secure, stable, accessible record, visible to users but anonymous to others

- Complete audit trail

- No bureaucracy

- Ability to introduce additional services on top of the platform

Caselet 17: Cryptocurrency Investments on Current Trading Platform

Business Scenario

Millennials are intrigued by cryptocurrency investments and may want them in their portfolios. Such investments require easy fiat-cryptocurrency exchanges and vice versa, compliance with regulations, e.g., KYC, ALM, SOF, and US tax reporting as capital gains/losses

Suggested Role of Blockchain

Launch an app-based service:

- An easy, cheap, secure and stable currency exchange using one platform by providing "wallets" and an exchange market (similar to Coinbase's platform) to enable trading and liquidity for customers
- Links to existing trading platform / bank account to ensure compliance with regulations
- Real-time cryptocurrency trading tax calculations
- Buy/sell cryptocurrencies, and use them to buy/sell investments

Expected Benefits

Enables members to explore new investment opportunities, e.g.,

- Using cryptocurrencies to buy and sell securities

- Owning and trading cryptocurrencies and ETFs

- Arbitrage between fiat and cryptocurrencies

5. OPPORTUNITIES AND CHALLENGES

- Blockchain technology allows for gradual improvements to operational methods as well as drastic changes to company structures.

- Blockchain's trust mechanisms and interaction paradigms will have an influence on the economy, society, and governance, in addition to today's business.

- Many current blockchain interpretations are based on a misunderstanding of the technology's potential or presume a limited reach.

- Current corporate IT frameworks and paradigms do not fully handle the possibilities of blockchain since blockchain is not scalable and not adaptable to current company settings.

- Weak proofs of concept (POCs)t are the result of a lack of knowledge, a lack of proven scalable models, an inability to envision beyond today's business paradigms, a lack of talent, and internal and external pressure to act.

- When several organisations in an ecosystem demand a shared single version of the truth and no one entity has control, blockchain initiatives add value. This explains why blockchain initiatives for provenance and asset tracking are advancing at a quicker pace, notably in utilities and wholesale trading.

- Due to challenges with ecosystem management and commitment, as well as a lack of financing for immature technology, blockchain initiatives frequently stagnate or fail. These challenges are especially frequent in the financial and healthcare industries.

- By combining blockchain with IoT, players in the business ecosystem may develop new income streams, save expenses, and increase customer experiences and trust. Organizational systems, on the other hand, are exposed to increased risks and complexity as a result of this integration.

- While blockchain technology has a lot of components, important technological advancements like tokens and decentralised anonymous consensus are uncommon in mature corporate blockchain applications.

6. WAY AHEAD

The standard problems that blockchain still faces include that of security and the existing mentality of people when it comes to traditional architectures. A lot of money and time has been spent by the large companies to synthesize a procedure and expecting the whole system to change overnight is perhaps farfetched. However, there is no denying as to how easy and time saving the entire process of supply chain management will be made by introducing aspects of blockchain into it. It ensures tamper free exchange of data and even ensures that the shareholders and transitory workers get paid for the work they do in real time. Through smart contracts, we can be sure that all the pre-conditions and requirements for the product are met. Security is also a huge issue as no one would want worldwide information to be hacked especially when the information is as vital as that of goods and products which the world runs on. So, in conclusion, it is safe to say that blockchain is still an incipient concept, but one with great and remarkable possibilities and in the near future, it might bring in something similar to a second global industrial revolution.

Technology Trends

- Blockchain will fast replace existing B2B solutions
- Through Smart-contract, Insurance process will undergo substantial change & will get simplified dramatically
- Supply-chain process will become very efficient and simplified by using Smart-contract
- EDI will be replaced by putting messages on Blockchain
- Customers not to build the ecosystem from scratch. Use of Public blockchain for POCs on the use-cases
- Blockchain-as-a-Service (BaaS)
- Blockchain and Middleware (Gateways and API, Data discovery, Event co-relation, Identity and Crypto Services, Integration with ERP, CRM systems, etc.)

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