BLOCKCHAIN TECHNOLOGY – A Prismatic Analysis

Human civilisation has so far witnessed three industrial revolutions, the last being computing power enabled manufacturing systems. It is widely being perceived that the next expeditionfor 'Industry 4.0' has started. This epoch-makingrevolution is expected to bring in inclusive digital transformations encircling every single sphere of life.In the new era, digitally-driven 'destruptive' technologies will 'innoventively' reengineersystems and processes of business operations for contributing towardsshared developments and touching lives of have-nots also in all corners of the world.

Impacts, generated by varioustechnologies, can be grouped into four categories, viz., transformational, high, medium and low. In foreseeable future emerging technologies under 'Industry 4.0' like Deep Learning, IET, Advanced Robotics, 3D Printing, Autonomous Cars, Brain-Computer Interface, etc. will create transformational impacts. Contrary to popular perception, the present author thinks Blockchain also will bring high transformational impacts which willultimately enhancebothcommercial and social RoI.

Several tons of paper have already been inked and zillions of bytes occupiedwith narratives and software onBlockchain. It is predictively being viewed that this technology will create equal, if not more, impacts than 'www technology'. Thistechnology is evolving. A deep sense of labor-pain for delivering values is being experienced. Hundreds of scientists are struggling to 'innovent' simplified applications for generating wide-scale impacts. One of such areasis popularly known as smart cities through inter-operable distributed ledgers, that form the core of a Blockchain

CMA Dr. Paritosh C. Basu
Senior Professor
NMIMS School of Business Management, Mumbai

Objective

Objective of this paper is to examine Blockchain technology through a prismatic analysis. It will look out for the present state of developments and predictive applications on which digital scientists are working. Through analytical research the present author will endeavor to feature out unique developments for mass-impacting applications in hitherto unheard-of areas.

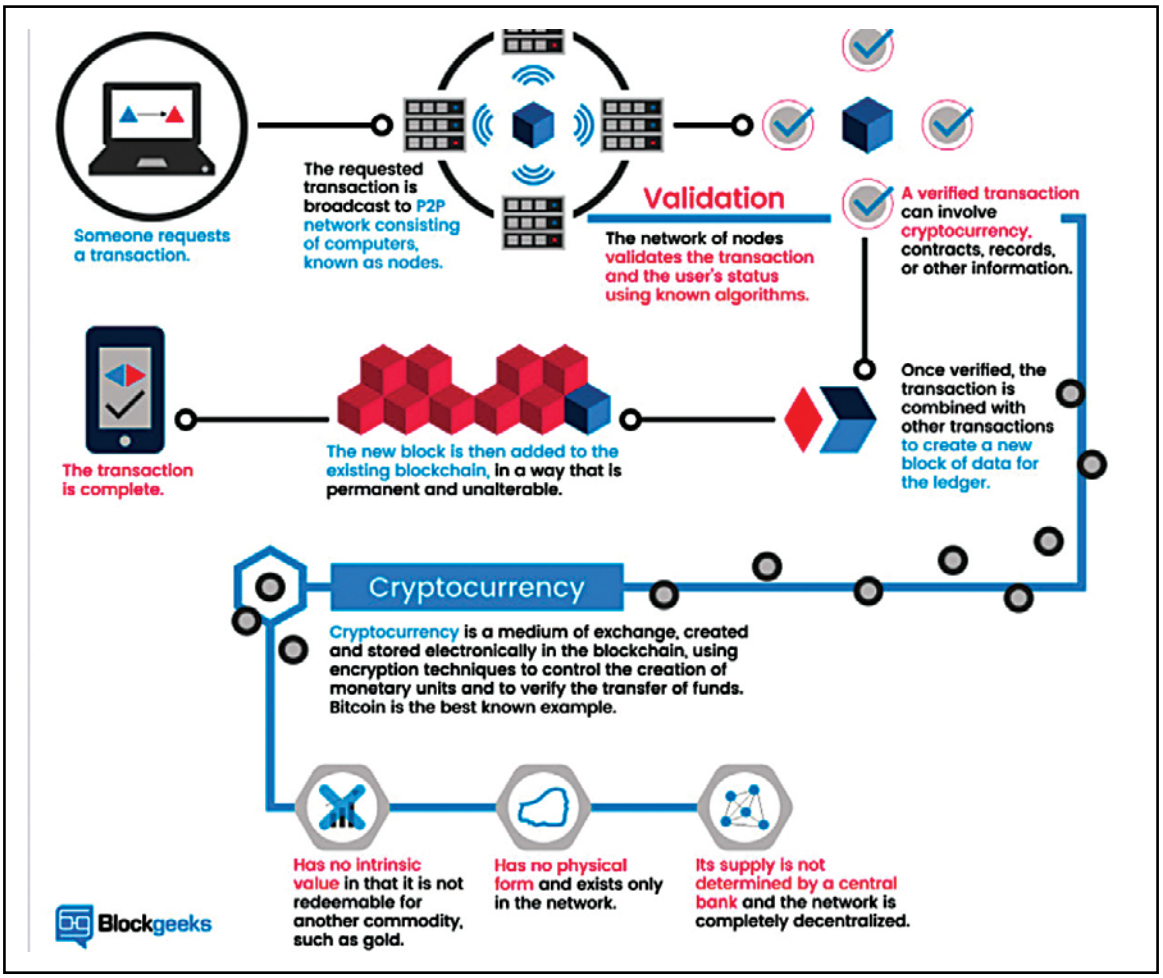
Attempts will be made to ideate challenges and critical success factors for this technology so that directional guidelines can be set for data scientists to keep in view at every step of application developments. Albeit the technology is prima-facie simple, its applications will involve very many participants demandingvalue creation abilities,unwavering trust, total transparency and more than hackable security measures.Thus the objective is to bring out thought provoking elementsneeded for achieving acceptance by mass, quantum leap innumber of areas for multidimensional applications transcending sovereign boundaries and impacting lives of all and sundry.

Blockchain Technology

In his seminal article Satoshi Nakamoto has described "Blockchain as a chain of digital signatures". A Blockchain is built on the foundation of participating parties, each of whom individually maintains their respective computing systems, called as a 'Node' in that chain. Each Node will hold all data as contained in the entire Blockchain. This system is technically called as Distributed Ledger (DL). Consistency of all these nodes is maintained by an elaborate system of cryptographic algorithm.

Transactions conducted by each node are posted to the DL in the form of a block that comprises cryptographed information associated with the data contained in the block. Anonymity of each online ledger is protected by simultaneous use of a private key and a public key. Each transaction conducted by a participating Node, e. g.,a patient, doctor, pathological laboratory radiological test centre, hospital, medicine vendor, insurance company, bank, etc. in a Health Care Blockchain is posted into the DL. Such posted transactions can be viewed by the targeted participant(s), for initiating the next transaction by using their respective private keys.

Success of a Blockchain,as a mass application oriented technology for both commercial and non-commercial purposes, e. g., voting system by a political government; critically depends on binding all the participants in the chain of transactions with one thread. That thread is the 'Smart Contract' hosted in the Blockchain platform for self-initiation of executory contracts binding the related party / parties. Success in this is expected to upshot transformational quantum leaps in technology applications by ensuring speed, distributed storage, sequencing of transactions and sensors. At this stage let the author state that he does not claim to know every bit of Blockchain. A simplified version of the flow of activities can be observed in the following graphic.



Source: http://www.iamwire.com/2016/12/startups-blockchain-technology-india/146811

According to Klaus Schwab, founder and executive chairman of the World Economic Forum, *"In essence, the blockchain is a shared, programmable, cryptographically secure and therefore trusted ledger which no single user controls and which can be inspected by anyone."*

The Gigantic Digital Universe and Strategic Imperatives

Deloitte University Press published a report in 2017 on technology trend and predictive analysis of digital universe. A summary of a relevant portion of the report brings out the following in terms of volume of digital data and their usability in 2013 and predictively in 2020:

Year	Total Size of the Digital Universe#	Data Usefulness if Analysed	Data from Mobile Devices and People##	Data from Embedded Systems	Remarks
2013	4.40 ZB	22%	17%	2%	Growth of data is @38.95% CAGR from 2013 to 2020
2020	44.0 ZB	37%	27%	10%	Only 37% of generated data will be useful

One ZB (Zetta Byte) is equal to one billion terabytes.## About 90% data from this source is unstructured.

Keeping in mind the above predictive developments,Leadership team of any organisation is expected to:

- Look through the windows to spot and track commercially useable technological developments and monitor the need for inhouse requirements;
- Treat and preserve digital data as the most valuable assetand ensure their safety and security;
- Reflect on markets, customers and business opportunities;
- Co-create digital analyses driven strategic plans for sustainable competitive advantages in red ocean of business area; make best use of first entering the blue ocean and stay there with the ability to grow till the product or service is commoditized;
- Draft and embed the "Smart Contract' in a manner that it can promote dynamically efficient pricing of product(s) / service(s) being offered;
- Execute for highest impact on RoI with least of profligacy and overconfidence; and
- Create an environment of IT Juris Prudence at all stages of systems developments and applications also ensuring data retrievability when needed for producing as legal evidences.

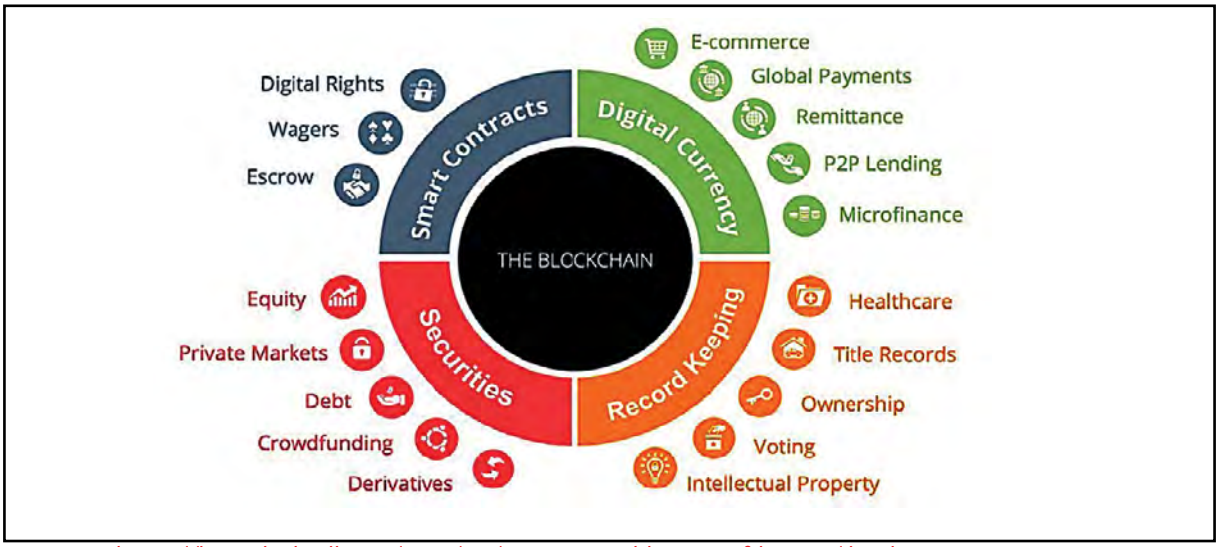
An interesting task would be to explore whether the Blockchain will be able to contribute for decision making and execution if it is used as an overlay on Data Analytics, AI, Machine Learning, etc.; and / or applied simultaneously for effecting transactions through Distributed Ledgers in a Blockchain enabled platform. One of the imperatives to be kept in mind is that success of Blockchain will predominantly depend on its ability to attract mass participation like'www Technology' and serve far better causes of humanity for inclusive growth of have-nots.

Blockchain – The Technology Power House

it is important at this stage to remove the commonly perceived misconception that Blockchain is synonymous to Bitcoin or Cryptocurrency and vice versa. Instead, not very far in future Blockchain technology will re-write unique process transformations that will create impacts in all walks of life. It will also encircle management of mass deliverables by a national level political and / or local self-government with huge administrative cost savings. It will also causemulti-orbital leapsof speed, quality, governance, transparency,profit and profitability of commercial transactions.

The present author's research indicates that Blockchain is being tried for more than one hundred applications, including unique ones like severally and jointly protecting the intellectual property rights of a lyricist, musician and singer of a song; rights of expressing verbal and written views on any socially / politically intriguing issue, etc.

The following graphic shows some of the illustrative applications of blockchain technology for which proof of concept has already been established by government and / or private agencies



Source: https://briandcolwell.com/2017/06/a-giant-sized-history-of-bitcoin/.html

For the sake of brevity detailing of various applications using Blockchain, for which proof concept has already been established, have been avoided. The reader can get plenty of published literature in cyberspace. Analytical study of some of those literature reveals that Blockchain is expected to bring in the following unique system transformations and rewrite business processes for taking a quantum leap in impactful value deliveries:

- 'Destrupt', (destructive disruption) traditional business models;
- 'Bizrupt', (disrupt business process) the latestcommercial operating processes;
- Service deliveries through a seamlessly and cryptographically secured chain link and keyless signature infrastructure;
- Replace traditional model of institutional banking and rendering services by players in BFSI sector;
- Rewrite the inclusive character of digital technology applications touchinghuman beings in massdiagonally all strata of society within and across sovereign boundaries; and
- Cause significant legal and regulatory disruptions transcending sovereign boundaries;

Thus,Distributed Ledger Technology would be a useful economic overlay to what is increasingly becoming a seamless multidevice computing, including wearables, IET, etc. Blockchain layer could facilitate BigData's Predictive Task Automation and its predictive analysis could dovetail perfectly with automatic execution of smart contracts. Combination of Big Data and Blockchain will enable data analytics from proactive to reactive to predictive analysis.

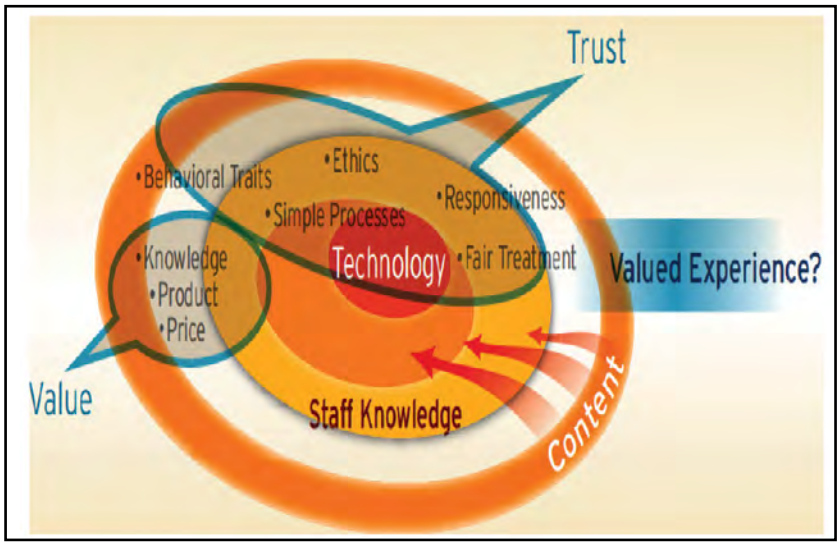
It is an imperative at this stage to remember that what one trusts may not be true and what is true may not be trusted by the same person. In order to be acceptable by all and ensure applications by mass,Blockchain, therefore, must believe in and ensure that only one single version of truth is captured in the 'Smart Contract' and that is built on the foundation of trust and transparency as more detailed below.

Blockchain – Challenges in Business Solutioning

Challenges before Blockchain technology are being analysed in two segments, viz., business solutioning and framework building. At the outset, one must remember the 7Ts and 7Ps for achieving success in development and application of any new technology in 'Industry 4.0' with the axiomatic motto that any development is not sustainable unless shared with common mass beyond the realms of rich people.

7Ts for Success in Technology Application	*7Ps for Shared Development*
● Technology	● People
● Talent	● Patience
● Truth	● Passion
● Trust	● Perseverance
● Transparency	● Piety
● Tenacity	● Purity
● Timeline	● Penance

Using the above directional building blocks for success one can adopt the challenges in business solution through the following graphic:



Source:https://www.cognizant.com/InsightsWhitepapers/Digital-Banking-Enhancing-Customer-Experience-Generating-Long-Term-Loyalty.pdf

Visual analysis of the above graphic prompts us to set the following four points as the simple guidelines for application of any technology for business solutioning and the elements for ensuring the same through Blockchain:

- Transparent representation of value proposition through a transaction(s) – Embedding of the 'Smart Contract' with buy-ins of all participants including capability for dynamic pricing;
- Facilitating customers' decision-making process – Hosting the 'Smart Contract'with one version truth and ability to see all prior transactions in the chain through use of Public Key;
- Ability to serve any customer who takes access into the platform without any minimum value limit to serve common people and MSMEs in general and not the HNIs or large customers only;
- More than hackable security of information and protection of wealth – Cryptographically enabled security system with keyless signature infrastructure for distributed ledgers in the same chain.

However, even compliance of the above guidelines may not be sufficient since following more challenges are to be met by Blockchain for universal acceptance and success with shared benefits:

- Providing business-ready solution rather than only sporadic disjointed applications;
- Interoperability between more than one Blockchains when one or more of the parties, required to complete a set of transactions, is / are not participating in the same Blockchain. For example, different bankers of the patient, hospital, pharmacy and the insurance

company respectively, participatingin a health care chain, may not be in the same Blockchain for effecting receipt / payment of considerations against an executed transaction;

- Handling of legal and regulatory interventions related to banking, taxation, foreign exchange, etc. in a cross-border transaction with differences between more than one sovereign authorities. This will essentially require non- straight jacketing of solution through the 'Smart Contract';
- Sustainability through dynamic business environment where VUCA elements are changing quite frequently posing challenges in execution of the 'Smart Contract'; and
- Minimisation of value destruction across all applications ensuring that cost for saving costs is not more than cost saved.

Blockchain – Challenges in Framework Building

At this stage, the present author is thoughtful about the axiomatic statement, *"If you don't know what you don't know then you don't know how to fix it"*. Keeping this in view and considering the challenges in solution building one can think through the following more challenges in application framework building forsuccess of Blockchain technology:

- Creating an innovation driven dynamic framework which is easy to comprehend, user friendly and simple to operate;
- Secured and safe storage of immutable and auditable data which are invaluable assets for value creation in future and retrieving those if needed as evidences for any legal proceedings;
- Dynamic business process management using cold data in distributed ledgers maintained by the Blockchain platform;
- Facilitate the process of strategic planning, day to day business decision making and execution in both short and long term;
- Omnichannel mastery in digital solutions for solving customers' problems simultaneously with facilitation of business process management. In this context,one more challenge is to make associated data from mobile devices usable;
- Interoperability of Blockchains and their collaborative integration to ensure wider participation; and
- Last but not the least ability to serve across various strata of the society irrespective of economic status.

Blockchain and Finance Professionals

Right from the traditional systems of IT enablement, ERP applications and present day high impact creating digital applications, finance professionals have always played critically important roles. The success of any digital technology driven application depends on accurately defining of business policies, rules and SOPs, conducting simulated UATs etc. Importance of these haslegally been recognised through introduction of Sections 134, 143 and 177 of the Indian Companies Act, 2013 regarding IFC for FR and OFC.

In the emerging digital ecosystem,both at macro and micro levels,data is being considered as the most valuable asset. It is the finance professionals who are better equipped to anlyse, introduce relevant enquiries, interpret summarised outcomes and in turn better report the same for planning, dynamic decision making and execution. Blockchain is no exception to this phenomenon.

In this discourse the present author has emphasised the need for execution of self-initiated executable transactions using the 'Smart Contract' embedded in a Blockchain platform. Here again finance professionals have a large role to play in setting commercial terms and conditions, norms for dynamic pricing principles. They must collaborate with legal professionals also for ensuring compliance and multi-faceted risk management.

Concluding Observations

Distributed Ledger Technology will succeed in attaining 'Darling of the Mass' status like 'Internet' if it is adopted and applied with the mindset of universal altruism. It should be grounded on the humane foundation of shared values. Blockchain technologists cannot afford to adopt or strive for attaining the status ofa technology tribe. They must not serve only corporates and HNIs, keeping themselves away from the lower rung of society.

Ultimately Blockchain based commercial applications will succeed if it can break political boundarieslike internet has broken geographical boundaries. Humanity is one and the world is its home. Hence it is an imperative that a global governing body,with members from various nations, is formed for directional guidance and monitoring matters of commercial, legal and regulatory implications when a transaction transcends sovereign boundaries. If you want the market-lion's head as the Winning Trophy, do what you have never done and solve all pervasive customers' and users' those problems none has ever identified. MA

Bibliography and Webliography

1. *Melani Swan, Blockchain – Blueprint for a New Economy, Second Indian Reprint, May 2017, O'Reilly*
2. *Satoshi Nakamoto, What Is a Blockchain?, American Banker20https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-what-is-blockchain-2016.pdf*
3. *Paritosh C. Basu, Blockchain – Looking Through the Prism. Presentation at the World Blockchain Summit. Dubai, October 2017. http://www.innoventionians.com/block-chain-presentation-dubai/*
4. *Punit Renjan; Industry 4.0: Are You Ready? Deloitte Review, Issue 22, January 2018. https://www2.deloitte.com/insights/us/en/deloitte-review/issue-22/industry-4-0-technology-manufacturing-revolution.html?id=gx%3A2el%3A3dc%253%E2%80%A6*
5. *Startups, Technology, 10 Startups Leveraging Blockchain in India Technology in India.*
6. *http://www.iamwire.com/2016/12/startups-blockchain-technology-india/146811*
7. *Brian D. Colwell, A Giant-sized History of Bitcoin, June 2017*
8. *https://briandcolwell.com/2017/06/a-giant-sized-history-of-bitcoin/.html*
9. *Steven DeLaCastro, Simon Erdmann, Ashwin Krishnan, Makarand Pande, Digital Banking, Enhancing Customer Experience; Generating Long-term Loyalty, Cognizant.https://www.cognizant.com/InsightsWhitepapers/Digital-Banking-Enhancing-Customer-Experience-Generating-Long-Term-Loyalty.pdf*
10. *Research Team, Tech Trends, 2017– The Kinetic Enterprise, Deloitte University Presshttps://www2.deloitte.com/content/dam/Deloitte/global/Documents/Technology/gx-tech-trends-the-kinetic-enterprise.pdf*

Note: The author acknowledges with thanks review comments of Dr. Somnath Roy, Associate Professor of NMIMS School of Business Management, on core technical section of this paper.

paritosh.basu@nmims.edu

Kolkata, the 19th January, 2018

NOTIFICATION

16–CWR (23585)/2018: In pursuance of Regulation 16 of the Cost and Works Accountants Regulations, 1959, it is hereby notified that in exercise of powers conferred by sub-section (2) of Section 20 of the Cost and Works Accountants Act, 1959, the name of Shri Parveen Kumar Sharma, BCOM, ACMA, # 1024/2, Sector 45-B, CHB Flats, Chandigarh – 160 047 (Membership No. 19843) has been removed from the Register of Members, with effect from 8th January, 2018 for a period of three (3) months i.e. till 7th April, 2018, in pursuance of Order issued vide letter no. G/DD/Secy/(M-19843)/1/01/2018 dated 8th January, 2018 passed by the Disciplinary Committee under sub-section (3) of Section 21B of Cost and Works Accountants Act, 1959.

Sd/-
(Arnab Chakraborty)
Secretary (Acting)