



भारतीय दिवाला और शोधन अक्षमता बोर्ड
Insolvency and Bankruptcy Board of India

IBBI RESEARCH INITIATIVE

RP-01/2022

Information Utilities and Blockchain: An Unlikely but Holy Partnership

Ankeeta Gupta

March 2022

Insolvency and Bankruptcy Board of India

Research Division, 2nd Floor, Jeevan Vihar, Sansad Marg, New Delhi – 110001

Email: research@ibbi.gov.in; Web: www.ibbi.gov.in

The Insolvency and Bankruptcy Board of India (IBBI), in its endeavour to promote research - legal, economic and interdisciplinary - and discourse in areas relevant for the evolving insolvency and bankruptcy regime in general, and that in India, introduced the IBBI Research Initiative, 2019 on 1st July 2019.

The views expressed in these papers are those of authors and not that of IBBI. Comments and observations may please be forwarded to authors or to the IBBI at research@ibbi.gov.in.

Information Utilities and Blockchain: An Unlikely but Holy Partnership

Executive Summary

The current paper aims at studying the implications of incorporating blockchain technology as a functional and foundational technological mechanism for working of Information Utilities in India. The Insolvency and Bankruptcy Code, 2016 has brought about a paradigm shift by implementing the concept of Information Utilities in letter and spirit which was only known as concept in the 1970s developed by Rand Corporation. A national network creating a financial database allowing for greater symmetry in financial information availability and circulation amongst all the stakeholders within the credit economy has been heralded as the institution which is the need of the hour. The complex financial transactions having tentacles embedded deep into the multitude of financial institutions, corporate entities forming a web over the corporate economy is in dire need of a simplification algorithm which can help study, analyse and disseminate the data in a manner that helps the stakeholders to take efficient and effective decisions. In this scenario it is pertinent to note that Information Utilities in India created in the backdrop of Credit Information Companies and the Central Registry of Securitisation Asset Reconstruction and Security Interest has managed to elicit maximum response from the stakeholders. As on date India has only one registered Information Utility under the name and style of National E-Governance Services Limited (NeSL). NeSL has received backing from Government of India and the state-owned agencies including the Reserve Bank of India, the Ministry of Corporate Affairs and the Insolvency and Bankruptcy Board of India for all of its initiatives directed at establishing a national repository of financial information converging the use of Application Program Interface (API), Digital Documentation Execution (DDE), and Platform of Distressed Assets (PDA). These along with execution of information sharing agreements and smart contracts initiatives with major banks and financial institutions in the country have provided the institution with significant boost and publicity in the public eye. However, Information Utilities as a concept have yet to establish their dominance as a credit information analytics institution as envisaged by the drafters of Banking Law Commission

Report. As is with the case of any new institution the gestation period for evaluating success of the Information Utility seems to be higher than anticipated.

Data analysed and research conducted indicates existence of extreme trust deficit amongst the stakeholders w.r.t the functioning and methodology followed by the Information Utility. These concerns get amplified on account of the fact that the information being shared is sensitive as it pertains to the financial health of the company. Lack of knowledge, information and understanding of the methodology used by the Information Utility further adds to the confusion. During a pilot study it was found that a miniscule 5% of the sample size were actually using the services of the Information Utility while a 58% of the population decided to reserve their comments on the functioning of the Information Utility. Only about 21% people actually admitted to being aware about the formation of the Information Utility. These numbers indicate that while Information Utility is in its nascent stages of development there is probably a need for re-assessment of the fundamental technology being used for Information Utility which may help accentuate the reliance of stakeholders in the institution.

It is thus suggested that adopting a more transparent and technologically advanced method of data storage, analysis and dissemination would help improve the efficacy of the Information Utility. It is thus the case of the researcher that blockchain technology be used as the foundational and functional methodology for the functioning of Information Utility. Blockchain technology is a mechanism of data storage whereby the data is stored in blocks chained together using cryptographically created hash functions allowing easy access of the blocks to all the participants on the network. One blockchain contains several participants referred to as nodes who are allowed access after verification of their identities and credentials. Thus, while ensuring integrity and security of the network a blockchain allows accessibility to the information shared on the network. This easy accessibility allows for speedy verification of data thus shared by the participants allowing an automatic authentication of data thus shared on the network. While there exist many challenges which emanate out of the benefits so accorded to the network run by blockchain technology, these are far outweighed by the benefits that the blockchain can offer for improving the viability of Information Utility.

Information Utilities and Blockchain: An Unlikely but Holy Partnership

Ankeeta Gupta*

Abstract:

Information Utilities in India as envisaged by the Insolvency and Bankruptcy Code, 2016 is likely to bring about a paradigm shift in the manner in which credit information is collected, collated, and disseminated provided it garners enough support from all the stakeholders within the credit economy of the country. Since 2017, the inception of Information Utility under the name and style of National E-Governance Services Limited, the performance of the only Information Utility in India has been dismal with only 600(approx.) credit information agreements being executed and fewer stakeholders agreeing to use the services as evidenced in the challenge made in case of *Univalve projects v. Union of India*. With such challenges against a nascent one of its kind institution viz. Information Utility, it becomes imperative that an attempt be made to improve its efficiency using a technology viz: blockchain as the functional modicum of Information Utility. Blockchain technology with its cryptographic tools of block building ensuring immutability, permanence of records, transparency and information symmetry is a good fit for forming the foundational tool behind working of Information Utility. Its shortcomings notwithstanding the benefits far outweigh the challenges and the same has been opined by various thinks tanks and policy makers viz: OECD, IMF, World Bank and Niti Aayog.

* Assistant Professor, National Law University, Odisha. I am also pursuing Ph.D at Faculty of Law, University of Delhi. I can be reached at ankeeta27@gmail.com for any comments, clarifications etc.

I am grateful to the Insolvency and Bankruptcy Board of India (IBBI) in supporting this study under "The IBBI Research Initiative, 2019". I wish to thank the anonymous reviewer, whose comments greatly helped us in improving the clarity of analysis. All errors are my own. This report is submitted in final form in December, 2021

Contents

1. Introduction	1
1.1. Statement of the Problem	3
1.2. Review of Literature.....	4
1.3. Hypothesis.....	7
1.4. Aims and Objectives	7
1.5. Research Questions	8
1.6. Research Methodology.....	8
1.7. Details of Research Conducted	9
1.8. Chapterisation.....	9
2. Historical Background of Information Utilities.....	10
3. Concept of Information Utilities	12
3.1. Why Information Utilities	14
3.2. Importance of Information Symmetry.....	15
3.3. Establishment of Information Utility	16
3.4. Process followed by Information Utility.....	18
3.5. Supply and Verification of Information	21
3.6. Data Integrity.....	22
3.7. Function of the Information Utility.....	24
3.8. Obligations of an Information Utility.....	25
4. Analysis of Working of National E-Governance Services Limited.....	26
5. Challenge to working of Information Utility	34
6. Concept of Blockchain.....	38
6.1. Important Characteristics of Blockchain.....	42
6.2. Types of Blockchains	44
6.3. Process working of Blockchains	45
6.4. Benefits of Blockchains	46
7. Why Blockchain.....	48
8. Integration of Blockchain with Information Utility	51
9. Blockchain in other Jurisdictions.....	56
10. Challenges in working with Blockchain Technology	61
11. Conclusion	62

1. Introduction

With the world on the brink of Industrial Revolution 4 technological advancements and innovations can no longer be ignored and lawyers cannot continue to remain in their shell limiting their activities to only the black letter of the law. It is the need of the hour that the lawyers attune themselves to the technological innovations taking place and make an effort to implement and use them for betterment of delivery of legal services and implementation of the intended legislations. Over the years law has forged an extremely improbable yet an extremely fruitful relationship with the technological advancements that are taking place across the world. One such technology is that of Blockchain which though a reminiscent of cryptocurrency era has carved a niche for itself. Blockchain technology has opened new vistas for its operations within varied fields viz: financial services, energy sector, recording of title over land, vaccination records, refugees and immigration data etc. with financial services being the most important. It is in this context that the researcher is proposing use of blockchain technology for use by Information Utilities set up under the Insolvency and Bankruptcy Code, 2016 (hereinafter referred to as “**the Code**”).

It is well understood that the Information Utilities are repositories of financial information established under the Code for removing information asymmetry from the insolvency processes. These help the Code attain the objective of uniformity in transactions and transparency by ensuring that information asymmetry does not prejudicially affect the rights of the stakeholders. The core activities as envisaged by the Code for Information Utilities include collection, collation, authentication, dissemination of financial information of debtors in a universally accessible format, so as to allow the creditors access such information and ensure that there is no lopsided information giving any undue advantage to any of the stakeholders including the bidders.

The success of insolvency proceedings critically depends on availability of complete, correct, and upto-date information about the debtor. This information may not be available with every stakeholder in equal measure. The non-availability of the information and information asymmetry may impede resolution and compromise the objective of value maximisation and speedy resolution as given in the preamble of the Code.¹ To address these issues, the Code

¹ Preamble to IBC: *An Act to consolidate and amend the laws relating to reorganisation and insolvency resolution of corporate persons, partnership firms and individuals in a time bound manner for maximisation of value of assets of such persons, to promote entrepreneurship, availability of credit and balance the interests of all the*

envisages IU as repositories of financial information about debtors for expeditious completion of various processes under the Code.

Availability of adequate and reliable information from the prospective borrower is vital for taking decisions in relation to sanctioning of credit.² In the case of lending by banks, the basis for the credit decision is the information furnished by borrowers; for a corporate customer, availability of audited balance sheet, income and expenditure and other audited financial statements bestow certain amount of authenticity to the information furnished, which facilitate an objective and commercial decision with regard to sanctioning of credit facilities.³

However, these methods are often dictated by individual Banks/ Financial Institutions leading to skewed/ unbalanced, non-uniform techniques of furnishing information to the stakeholders. Thus, the need for a national network to provide real time financial data and information to creditors for prudent decision making.⁴ It is in this context that integration of Blockchain and Information Utility has been envisaged.

Blockchain simply put is an accounting book which records transactions after transactions in a manner that no alteration in the original information is possible. With its unique method of storing data and stamping of information, it ensures that no information is misused or erased to the prejudice of the people as deletion of any information from the ledger will not be possible without allowing all the parties to the transaction to view exactly when, where and by whom the original information was modified, changed or deleted. This ensures that no party can fraudulently make any changes to the prejudice of other stakeholders. Blockchain technology works as a digital ledger which ensures authenticity of the information that has been shared over peer-to-peer networks by all the stakeholders and at the same-time allows equal access to all the financial information by the stakeholders and decision makers.

In order to ensure that the purpose of IBC w.r.t. information symmetry is met it will be worthwhile to explore the possibility of using blockchain as one of the functional tools used for working the information utilities.

stakeholders including alteration in the order of priority of payment of Government dues and to establish an Insolvency and Bankruptcy Board of India, and for matters connected therewith or incidental thereto.

² The Price of Inequality, Joesph Stiglitz, 2012

³ Cass R. Sunstein, Simpler: The Future of Government, 2013

⁴ Bimal Jalan, Emerging India: Economics, Politics and Reforms, 2013

1.1. Statement of the Problem

National E-Governance Services Ltd, the first Information Utility in the country was incorporated in the year 2016 and has since been holding the mantle of the Insolvency and Bankruptcy Code, 2016 to introduce and assure information symmetry in Indian Corporate Economy. However, Information Utilities as a concept have yet to establish their dominance as a credit information analytics institution as envisaged by the drafters of Banking Law Commission Report. As is with the case of any new institution the gestation period for evaluating success of the Information Utility seems to be higher than anticipated This premise of the researcher is based on a pilot study conducted by the researcher wherein 100 Insolvency Professionals were interviewed to get a first-hand understanding of the functioning of the Information Utilities and its acceptability amongst the stakeholders. Insolvency Professionals were chosen as they work conjointly with both the creditors and the debtors and also face the maximum challenges during claim verification during a CIRP process.

Information Utility can be regarded as the biggest financial information equaliser, a one of its kind institutions across the world. Yet, the debtors, creditors and others have been trying to avoid transacting on the IU so much so that the NCLT in the matter of *Univalue Projects v. UOF*⁵ had to intervene and mandate filing of IU certificate as a proof of debt. The fact that the concept of IU has failed to generate any trust has been further vindicated by the 20th August, 2020 Order of Hon'ble High Court of Calcutta which was forced to overturn the NCLT order as a collective representation was made by financial creditors challenging the order.

It is the case of the researcher that acute trust deficit over digital mediums for financial information for the fear of misuse, breach or leakage in the wrong hands is *prima-facie* the reason behind the hesitation of stakeholders in accessing the institution. It is imperative to point out that the methodology followed by Information Utility for accessing, collecting, collating data is opaque resulting in a limited reliance of the stakeholders in the institution. There is very limited information about the functioning (i.e. functional software being used etc.) of the Information Utility on the website of NeSL. There has also been limited publicity about it resulting in confusions in the minds of stakeholders which in effect seems to be causing a reluctance amongst them to place complete reliance on Information Utilities conceptually. .. It is further pertinent to point out that even though a total number of 3100 cases have been filed

⁵ Order by NCLT Kolkata, dated May 12, 2020

with the IBC as on March 2021 not more than 600 agreements have been executed by the IU in its total life span covering a cumulative debt information of approx. 21,46,448.336 crore.⁶

It is the case of the researcher that blockchain technology as discussed earlier may be used as one of the functional tools for Information Utilities. A preliminary study indicates that the benefits of blockchain technology far outweigh the challenges associated with it and may be a good improvement over the existing mechanisms followed by Information Utilities.

1.2. Review of Literature

(a) Information Utilities are likely to bring about a paradigm change in enhancing information symmetry amongst all the stakeholders.

As analysed in Information Utilities: A Key Pillar of Insolvency Proceedings⁷ the Insolvency and Bankruptcy Code of India, 2016 has brought about a paradigm shift within the credit ecosystem of the country. Establishment of an institution viz: Information Utilities is intended to further the cause of the Code as stated in the Preamble by bringing information symmetry in financial information amongst all the stakeholders most importantly the creditors and the debtor.

As envisaged by the Bankruptcy Law Reforms Commission Report⁸, Information utilities are repositories of financial information established under the Code in order to remove information asymmetry from the insolvency processes. They help the Code to attain uniformity in transactions and transparency, ensuring that information asymmetry does not prejudicially affect the rights of the stakeholders. Chapter V of the Code details the broad framework for the formation, governance and core activities of Information Utilities.

However, Information Utilities as a concept have yet to establish their dominance as a credit information analytics institution as envisaged by the drafters of Banking Law Commission Report. As is with the case of any new institution the gestation period for evaluating success of the Information Utility seems to be higher than anticipated. This analysis is based on the results of the pilot study mentioned earlier in the proposal. It is pertinent to note that there exists only one IU in the country and its functioning has not inspired any confidence amongst

⁶ NeSL 4th Annual Report, 2019-20; available at https://nesl.co.in/wp-content/uploads/2020/09/4th-Annual-Report-NESL_2019-20.pdf

⁷ Information Brochure, 30th November, 2020, IBBI, <https://www.ibbi.gov.in/uploads/publication/ee64e0a0330c81c11c0ab538b5e4b946.pdf>

⁸ https://ibbi.gov.in/BLRCReportVol1_04112015.pdf

people to establish another Information Utility. The reasons behind the hesitation to embrace IU are manifold, the most prominent one apart from acute trust deficit being lack of knowledge about the functioning of IU. The research will explore reasons as well as ways and means of restoring trust amongst all stakeholders in the functioning of Information Utilities

(b) Blockchain Technology is a revolutionary technology

A lot of literature has now been brought to fore which indicates that the blockchain technology may be used independently of crypto currency. The fundamental technology on which blockchain operates ensures higher level efficiency and automation. A blockchain is often defined as decentralised ledger, record of information which is stored in immutable digital blocks locked digitally ensuring participation of all stakeholders at all times. Blockchain technology can create a ledger for any type of record.

As Professor Makoto Yano of Kyoto University has famously stated that, *“information stored using blockchain technology is absolutely accurate, and unfalsifiable, thus amassing economic value.”* It may be noted that many independent entities contribute to creating a book of permanent data that is absolutely accurate and unfalsifiable. Participation by interconnected yet independent stakeholders helps conducting immediate verification of financial transactions and records. Any inconsistency in data can be immediately identified and rectified using the artificial intelligence mechanism supported by the blockchain technology. Organisations viz: OECD and Nasscom have thus accepted the view that immutable financial records thereby created by blockchain have significant commercial value trust and confidence of all the stakeholders.⁹ By making a ledger of data, a blockchain makes it possible to designate the owner of each piece of data, to trade data pieces, and to market them. Thus ensuring that the financial data can in no manner be jeopardised or falsified to the detriment of the stakeholders.

(c) Applicability of blockchain technology to Information Utilities would enhance its functioning and applicability in the corporate economy.

Blockchain technology seems a perfect fit for Information Utilities which need to not only collect, store and collate financial data but also verify, reconcile and store financial information in a readily available format for access during initiation of CIRP process. The ultimate goal of

⁹ OECD Blockchain Primer, available at <https://www.oecd.org/finance/OECD-Blockchain-Primer.pdf>
NASSCOM Avasant India Blockchain Report 2019, <https://www.nasscom.in/knowledge-center/publications/nasscom-avasant-india-blockchain-report-2019>

Information Utilities is to ensure information symmetry amongst all stakeholders to ensure speedier, credible and efficient insolvency proceedings. The biggest conflict that arises during insolvency and financial restructuring pertains to financial numbers as claimed by creditors and as admitted by the debtors. With Information Utility this tussle is envisaged to be reduced. Blockchain technology is immutable and unfalsifiable. It is suggested that the two be reconciled to develop a robust Information Utility mechanism in India.

(d) Blockchain's adaptability in Financial Realm.

Blockchain has since its introduction attracted immense attention with many organisations testing its feasibility for use in arenas other than crypto currency while remaining within the financial sphere. Blockchain as discussed earlier is the functional structure of cryptocurrency allowing for transparent and efficient use, transmission and storage of digital currency. Blockchain technology has since been tested by various institutions, companies and governments in areas of governance, maintenance of public records¹⁰, recording of financial matters, insurance matters, subsidy awards¹¹ etc. In the years since the Addis Ababa Action Agenda (AAAA)¹² of United Nations, first called for a new financing framework for sustainable development using technological innovations, a number of agencies, particularly multilaterals, have been experimenting with blockchain technology. For instance, the World Bank established a Blockchain Lab in 2017, and humanitarian organisations such as the United Nations Children's Fund (UNICEF) and the World Food Programme (WFP) continue to explore the benefits of employing blockchain to facilitate the disbursement of cash-based aid and digital identities¹³. Amongst others, USAID¹⁴ and the German Development Agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH¹⁵ have both published

¹⁰ Coppi, G. and L. Fast (2019), "Blockchain and Distributed Ledger Technology in the Humanitarian Sector", Overseas Development Institute, HPG Commissioned Report, <https://www.odi.org/sites/odi.org.uk/files/resource-documents/12605.pdf>

¹¹ Coinfy (2017), Hack the Future of Development Aid, https://www.bond.org.uk/sites/default/files/resourcedocuments/hack_the_future_december_2017.pdf. [8] ConsenSys (2020), <https://consensys.net/>.

¹² United Nations (2015), Addis Ababa Action Agenda, https://www.un.org/esa/ffd/wpcontent/uploads/2015/08/AAAA_Outcome.pdf.

¹³ Pisa, M. (2018), "Reassessing Expectations for Blockchain and Development", Center for Global Development Note, <https://www.cgdev.org/sites/default/files/reassessing-expectationsblockchain-and-development-cost-complexity.pdf>.

¹⁴ Nelson, P. (2018), A Primer on Blockchain, <https://www.usaid.gov/sites/default/files/documents/15396/USAID-Primer-Blockchain.pdf>.

¹⁵ GIZ Blockchain Lab (2019), Blockchain: A World Without Middlemen? Promise and Practice of Distributed Governance, https://www.giz.de/en/downloads/giz2019_en_blockchain_world_without_middleman.pdf

primers on blockchain. Elsewhere, the Danish¹⁶ and United Kingdom development agencies published their own documents exploring the ways in which blockchain could be used to enhance aid and development programmes¹⁷. In parallel, the key messages from the annual Blockchain Africa Conference demonstrate that a growing number of developing countries are seeking to be included in this conversation.¹⁸

Blockchain technology has caught the attention of the institutions worldwide with global alliances, research labs, strategy documents, pilot studies and feasibility studies. It is being seen as having the potential to transform economies and industries and according to Niti Aayog block chain could generate USD 3 trillion per year in business value by 2034. Similarly, the World Economic Forum anticipates that 10% of the global GDP would be stored on blockchain by 2025 and is hailing it as a revolutionary, game changer technology.

1.3. **Hypothesis**

The limited acceptability of Information Utilities as an information equalizer in the corporate economy may be corrected by incorporating blockchain technology in the functioning of Information Utilities for ensuring absolute transparency and accountability.

1.4. **Aims and Objectives**

The aims and objectives of the study are as follows:

- (a) To study and understand the concept, functioning and goals of Information Utilities.
- (b) To study the technological underpinnings surrounding the functioning of Information Utilities.
- (c) To evaluate the efficacy of the IU contracts in terms of the objective of IU to collect, collate, analyse and disseminate financial information.
- (d) To study and understand the functioning of Blockchain technology.

¹⁶ Mulligan, C. (2016), Application of Distributed Ledger Technology within Department for International Development. And Mulligan, C., P. Godsiff and A. Brunelle (2020), “Boundary Spanning in a Digital World: The Case of Blockchain”, <https://doi.org/10.3389/fbloc.2020.00037>.

¹⁷ Coinfy (2017), Hack the Future of Development Aid, https://www.bond.org.uk/sites/default/files/resourcedocuments/hack_the_future_december_2017.pdf. [8] ConsenSys (2020), , <https://consensys.net/>.

¹⁸ Medium (2017), Fintech for All: Seso founder on building a blockchain land registry for Africa, https://medium.com/@The_LHoFT/fintech-for-all-seso-founder-on-building-a-blockchain-landregistry-for-africa-6909c27d141d. and Move Africa Forward (2020), Blockchain Africa Conference. <https://blockchainafrica.co/event/blockchain-africa-conference-2020-johannesburg/>

- (e) To study and analyse the feasibility of integrating functioning of Information Utilities and Blockchain Technologies.
- (f) To Study the adaptability of Information Utilities in the Indian Corporate Economy and its implications on bringing information symmetry between the debtors and the creditors.
- (g) To study the challenges in integrating the blockchain technology and Information Utilities.

1.5. **Research Questions**

Q1. How does Information Utility function as envisaged by the Insolvency and Bankruptcy Code, 2016?

Q2. What is the nature of work/ output desirable of an Information Utility for the purposes of the Insolvency and Bankruptcy Code 2016?

Q3. To what extent has Information Utilities been successful in bridging the gap of information asymmetry between the debtors and the creditors?

Q4. To what extent have the IU agreements been able to achieve/ help achieve the objectives of the IU in terms of collecting, collating, analysing and disseminating financial data?

Q5. What is the feasibility of integrating the functioning of Information Utilities and Blockchain Technology?

Q6. What is nature of working of Blockchain Technology?

Q7. What are the advantages and challenges likely to present in integrating Blockchain Technology with Information Utilities?

1.6. **Research Methodology**

The researcher aims at conducting a doctrinal study with studying the functional tenants of Information Utility and Blockchain Technology.

Analytical Research: The Researcher employed analytical research for studying the integration of Blockchain Technology with Information Utilities in terms of the areas of compatibility, challenges in integrating the two and attempting a pre-assessment of the achievement of the final goal of introducing information symmetry in the corporate economy.

Empirical Research: For making the above doctrinal and analytical research, the researcher attempted to access National E-Governance Services Ltd. the only Information Utility in the country for accessing IU contracts and the understanding the methods followed by them for storing, working and reconciling financial information. This will be subject to confidentiality concerns of the organisation and availability of information in the public domain.

1.7. Details of Research Conducted

The descriptive and analytical data was conducted by use of articles, opinions and readings available online pertaining to Information Utilities and Blockchain technologies. These have been discussed in the subsequent sections.

In addition, further empirical research was carried out by the researcher in terms of qualitative empirical data collection by way of interviewing 100 insolvency professionals. For the purposes of the interview the data of 2832 Insolvency Professionals as available on the IBBI website as updated upto 31st March, 2020 was used and individual emails were sent to them seeking their views on the subject and requesting them for an interview. Of these 2832 a total of 147 Insolvency Professionals responded 47 of these shared no or incorrect contact information on account of which the researcher was able to actually interview 100 Insolvency Professionals.

1.8. Chapterisation

- 1) Introduction
 - a. Statement of Problem
 - b. Research Methodology
 - c. Aims and Objectives
 - d. Research Questions
 - e. Hypothesis
- 2) Historical Background of Information Utilities
- 3) Concept of Information Utilities
- 4) Analysis of functioning of Information Utilities in India
- 5) Challenges of working of Information Utility
- 6) Concept of Blockchain Technology

- 7) Need for Integrating Blockchain Technology and Information Utilities
- 8) Challenges in employing Blockchain Technology in functioning of Information Utilities.
- 9) Conclusion

2. Historical Background of Information Utilities

Information Utility as the name suggests is designed to be a national utility of information pertaining to financial sector much like any other utility viz: electricity, communication etc. Even though Information Utility is new to India the concept of collecting, storing, sharing, and analysing credit related data is a well -established concept. However, no country has established an institution where credit related financial data is stored for helping companies during insolvency and bankruptcy proceedings. The fact that the Code has established such an institution in the form of IU for easing insolvency proceedings makes it one of a kind and unique institution having no parallel in the world, thereby making it impossible to conduct any jurisdictional or institutional comparisons.

The foundation of Information Utilities as a concept seems to emanate out of the idea behind Credit Information Companies and the Company Registry of Securitisation Asset Reconstruction and Security Interest that provided credit related information and services. It is pertinent to note that the first attempt to create a credit registry was done in the year 1962 when the Reserve Bank of India Act, 1934¹⁹ was amended to include credit information dissemination under the auspicious of the Central Bank. Subsequently the 1972 Banking Commission headed by R.G. Saraiya²⁰ recommended creation of a Credit Intelligence Bureau as a statutory body under a Credit Information Scheme, which was eventually dismantled in 1995 on account of laxity amongst persons and institutions in providing relevant and timely information.

¹⁹ Insertion of Section 45A-45G.

²⁰ Government of India, Report of the Banking Commission 1972, Chairman R.G. Saraiya

In the backdrop of the East Asian crisis²¹ the Central Bank established a working group under the chairmanship of Mr. N. H. Siddiqui²² in 1999 for exploring the possibility of establishing Credit Information Bureau and thus was born CIBIL (Credit Information Bureau of India Limited) in the year 2000 with operations beginning in 2004 and commercial exploitation beginning in 2006. In the year 2005 the Credit Information Companies (hereinafter referred to as **“the CICs”**) were introduced statutorily under the auspicious of the Credit Information Companies (Regulation) Act, 2005 (hereinafter referred to as **“the CIC Regulations”**). Thereafter 4 CICs were established in India.²³ These institutions exist even today and have recently undergone an overhaul with format standardisations and technological upgradations.

In 2015, all credit institutions were directed by RBI to become members of all the CICs and submit current and historical data about specified borrower to them and to update it regularly.

A central registry of equitable mortgages was also established called the Central Registry of Securitisation Asset Reconstruction and Security Interest²⁴ (hereinafter referred to as **“the CERSAI”**) to maintain and operate a registration system for the purpose of registration of transactions of securitisation, asset reconstruction of financial assets and creation of security interest over property, as contemplated under the Securitisation and Reconstruction of Financial Assets and Enforcement of Securities Interest Act, 2002 (hereinafter referred to as **“the SARFAESI Act”**). CERSAI is providing a platform for filing registrations by the Banks and FIs with an option for other lenders and the public to search its database.²⁵

The idea to establish IUs appears to be an outcome of the research and efforts to set up a hybrid model unique to India by incorporating the best features of CICs, CERSAI and other similar agencies across the world that are engaged in financial information services. Infact, the Reserve Bank of India in 2017 carried out an amendment in the CIC Regulation, 2005 to allow

²¹ Anand Prakash, Major Episodes of Volatility in the Indian Foreign Exchange Market in the Last Two Decades (1993-2013): Central Bank’s Response, Reserve Bank of India Occasional Papers Vol. 33, No. 1 & 2: 2012 available at <https://rbidocs.rbi.org.in/rdocs/Content/PDFs/8MEVIF270614.pdf>

²² Reserve Bank of India, “Report of the Working Group to explore the possibilities of setting up a Credit Information Bureau in India” (Department of Banking Operations and Development, October 1999)

²³ Reserve Bank of India Department of Banking Operations And Development, “Report of the Committee to Recommend Data Format for Furnishing of Credit Information to Credit Information Companies”, 2014, Aditya Puri

²⁴ Recent Policy initiatives in Credit Information Sharing (Keynote Address delivered by Shri R. Gandhi, Deputy Governor on March 3, 2015 at Seventh Annual CIBIL TransUnion Credit Information Conference, Hotel Trident, Mumbai

²⁵ Reserve Bank of India, “Report of the Committee to Recommend Data Format for Furnishing of Credit Information to Credit Information Companies”, (Department of Banking Operations and Development, January 2014)

Information Utility access to data stored therein as specified user. It is imperative to note that India is no stranger to documenting the credit data albeit in different methods and institutions, yet it has not yielded the desired results. With the establishment of Information Utilities, there is a likelihood of possible regulatory arbitrage if appropriate corrective action is not undertaken. The suggestion of establishing a Public Credit Registry (PRC) as suggested by High Level Task Force Committee headed by Y.M. Deosthalee²⁶ there now seems to be an overcrowding of credit data information in the country. With a clear over-crowding of institutions within the credit economy it is worthwhile to suggest that digitisation of records, use of technological processes and prowess be put to use to avoid overlapping and multiplication of data submissions as has been suggested in the forgoing sections.

3. Concept of Information Utilities

Information Utilities²⁷ are a new concept enunciated in the Code. It is a one of its kind concept creating a repository of financial information specifically pertaining to credit facilities being extended and sought by the creditors and debtors respectively to actually have been designed and implemented giving practical face to a theoretical and an academic thought envisioned way back in 1970s²⁸.

An Information Utility as envisioned and executed under the Code is one of a kind of an institution having no similarities anywhere in the global financial sector.²⁹ The Banking Legislative Reforms Commission Report while introducing the concept elucidated the rationale in the following words:

²⁶ Report of the High Level Task Force on Public Credit Registry for India, Y.M.Deosthalee, Reserve Bank of India Department Of Statistics And Information Management April, 2018

²⁷ Enunciated in the Banking Legislative Reforms Committee Report, T.K. Vishwanathan, 2015, available at: https://ibbi.gov.in/BLRCReportVol1_04112015.pdf

²⁸ Sackman H, Boehm BW (1972) Planning community information utilities. AFIPS Press, Montvale and Sackman, H, Nie N (1970) The information utility and social choice. AFIPS Press, Montvale It is pertinent to note that in 1970's some futuristic scientists at Rand Corporation in collaboration with scientists at Stanford University proposed creation on a nationwide network of information where people could get access to information without going through the bureaucratic process of the state. The idea behind it was to push for information symmetry according to all stakeholders equal opportunity to access information.

²⁹ Ibid, However, it has been defined with respect to other sectors as, “ the information utility was defined by its originators “as mass communications systems in which the consumer interacts directly with a central computer and its associated information files from a remote terminal at his home, office, or school – in his natural environment – in a man-ner such that he received the information at his terminal almost immediately after requesting it.” The information utility also includes contributing physical elements such as “television displays, communi-cations lines, computers, data stores, and support facilities”. Chen, R., Kraemer, K. & Sharma, P. Google: The World's First Information Utility?. Bus. Inf. Syst. Eng. 1, 53–61 (2009). <https://doi.org/10.1007/s12599-008-0011-6>.

*“Before the Insolvency Resolution Process(hereinafter referred to as **IRP**) can commence, all parties need an accurate and undisputed set of facts about existing credit, collateral that has been pledged, etc. Under the present arrangements, considerable time can be lost before all parties obtain this information. Disputes about these facts can take up years to resolve in court. The objective of the Code that an IRP be completed in no more than 180 days can be lost owing to these problems. Hence, the Committee envisions a competitive industry of information utilities who hold an array of financial information about all firms at all times. When the IRP commences, within less than a day, undisputed and complete information would become available to all persons involved in the IRP and thus address this source of delay.”*

The success of corporate insolvency resolution proceedings critically depends on availability of complete, correct, and upto-date information about the debtor. This information may not be available with every stakeholder in equal measure. The non-availability of the information may impede resolution and compromise the objective of value maximisation, while asymmetry of information may contribute to uneven sharing of the values. To address these issues, the Code envisages Information Utilities as repositories of financial information for expeditious completion of various processes under the Code.

Availability of adequate and reliable information on the prospective borrower is vital for taking decisions in relation to sanctioning of credit. In the case of lending by banks, the basis for the credit decision is the information furnished by borrowers; for a corporate customer, availability of audited balance sheet, income and expenditure and other audited financial statements bestow certain amount of authenticity to the information furnished, which facilitate an objective and commercial decision with regard to sanctioning of credit facilities. Thus, an institution of the nature of Information Utility is most suited for creating a transparent, efficient system of collecting, storing, collating and disseminating of credit data suitable for the purposes of the creditors as well as debtors.

As pointed out earlier that Information Utility is one of its kind institutions to have been designed and executed moving beyond the conceptualisation table which has found no parallel in the world of financial services. In India there is only one registered Information Utility and functions under the name and style of National E-Governance Systems Limited (hereinafter referred to as **NeSL**). NeSL being the first Information Utility has done a commendable job of implementing the BLRC vision in firmly establishing the Information Utility as the flagship

organisation which has paved the path for others to follow. NeSL has faced various legislative and technical challenges, which have been addressed with tremendous zeal and dedication. Yet, it is pertinent to point out here that NeSL is the actual embodiment of the concept of Information Utilities which thus mandates that the general laws, rules and regulations must be read in conjunction with the bye-laws of NeSL and the analysis of Information Utilities concept be conducted in tandem with the factual description of NeSL.

In the forgoing sections the organisation structure, process, functioning, obligations of the Information Utility will be discussed in detail as those enumerated within the Insolvency and Bankruptcy Code, 2016, Insolvency and Bankruptcy Board of India (Information Utilities) Regulations, 2017(hereinafter referred to as “**IU regulations**”), and the bye-laws drafted by NeSL for the purpose.

3.1. **Why Information Utilities**

The philosophy behind Information Utilities is to provide a reliable source of authentic and verifiable financial data pertaining to both the debtors and the creditors. All the participants within the insolvency process as laid down by the Code have been assigned specific roles which cannot be fulfilled unless there is parity of information amongst them all. This information essentially pertains to the credit worthiness of the debtors as well the ledger account of the debtor in terms of the debt undertaken by him. Access to this information by the stakeholders essentially allows them to take informed decisions which have a bearing not only on continuation or liquidation of the company but also for restructuring of the company.³⁰ It has been pointed out at various fora that implementation of the Information Utilities will help expedite CIRP process and help preserve the time value of funds. It has been found from various studies that information asymmetry within financial methods, banking sector, and financial matters has resulted in lopsided decision making over the past years.³¹ Financial Information in the hands of few to the prejudice of others has often resulted in financial losses which were attributed to business or commercial prudence but nevertheless eroded the faith of the stakeholders in the entire credit system. It is pertinent to note that an effective Information Utility would in-effect reduce the informational gaps and allow decentralised flow of data amongst the stakeholders, thereby promoting financial information symmetry.

³⁰ KVR Murthy, Working Group Report on Information Utilities, Ministry of Corporate Affairs, 2017 available at <https://www.ibbi.gov.in/wg-04report.pdf>

³¹ Mahdi Salehi, Vahab Rostami, and Hamid Hesari, The Role of Information Asymmetry in Financial Methods available at <https://core.ac.uk/download/pdf/25688215.pdf>

It has been suggested that the sustained use of Information Utilities will lead to the creation of financial database of all commercial entities allowing further transparency in extending and availing credit to and by the enterprises. Further availability of data in such transparent mechanism will also help develop a greater financial discipline amongst both the lenders and the borrowers, which in the light of various scams involving money laundering and financial irregularities is the need of the hour.

3.2. **Importance of Information Symmetry**³²

Over the years with the increase in industrialisation and development of credit markets, the credit ecosystem has witnessed a growing asymmetry in the financial information available in the hands of the stakeholders. Even though debt contracts are created establishing the rights and obligations of the parties the underlying information supporting the basis of the debt obligations has come to resemble zero sum games³³ played between the creditors and the debtor each trying to outsmart and out manoeuvre the other in seeking the maximum benefit for itself from the agreement so executed.³⁴ The lack of information symmetry amongst the stakeholders while taking decisions has of late been understood as a cause of disarray within the credit ecosystem resulting in unnecessary delays in grant of credit facilities, realisation of debts and increased disputes and conflicts amongst the stakeholders.

Information Asymmetry manifests itself in varied forms viz³⁵: adverse selection, moral hazards and monitoring costs resulting in skewed and imbalanced credit norms. The normativity within the credit economy is facts driven allowing the stakeholders a semblance of certainty w.r.t. the terms and conditions which guide the debt agreements. Information asymmetry jeopardises this normativity leading to significant chaos impairing economic growth and development in the long-run. There has been significant research to indicate that the deeper the credit information index, deeper is the credit penetration³⁶ (support to industrial growth and development), thereby prompting us to inculcate the mechanisms and institutions to promote information symmetry within the credit ecosystems.

³² Global Financial Development Report 2014: Financial Inclusion. Washington, DC: World Bank.

³³ Game Theory: Nash Equilibrium, John von Neumann and Oskar Morgenstern's The Theory of Games and Economic Behaviour

³⁴ Eatwell, J. M, Milgate and P. Newman(eds), 1989, Allocation, Information and Markets, The New Palgrave, London, Macmillan;

³⁵ Ricardo N. Bebczuk, Asymmetric Information in Financial Markets: Introduction and Applications, Cambridge University Press 2003

³⁶ Ease of Doing Business, 2012, World Bank

Information sharing helps the creditors to not only screen debt seekers but also helps in monitoring credit risks with reduced cost of intermediation, facilitating transparent, efficient and sustainable lending with certainty in terms of realisation of debts.³⁷ Thus availability of reliable information with real time efficiency is of paramount importance which can be achieved by establishing such repositories of financial data with authenticated and verified data allowing all stakeholders equal access to financial information. It is the case of the researcher that Information Utilities form the fulcrum ensuring sustained credit realisation further accentuating credit delivery within the credit economy of India on account of the collection, collation and dissemination of real time financial data.

While Information Utility as a concept can be justified it is suggested that blockchain be used as the foundational technology for IU. In the next segment establishment and functioning of Information Utilities is discussed.

3.3. **Establishment of Information Utility**

Information Utility has been defined to mean an institution registered as such under section 210 of the Code³⁸ as defined in section 2(21) of the Code. Section 210 lays down the overarching process of registration of an entity as an Information Utility with the IU Regulations detailing specifics as discussed below. NeSL the only Information Utility in India is headed by Mr. R Gandhi, who took over the reins in April 2021 after Mr. Raman, the founding Managing Director stepped down after completing four (4) years.³⁹

Shareholding Pattern

The law mandates that an Information Utility can only be a Public Company with a minimum net-worth⁴⁰ of INR 50 crore and shareholding of each shareholder⁴¹ capped at 10% provided a declaration of fit and proper person is accompanied with request for shareholding exceeding 5% shareholding⁴². Thus, NeSL is a Government Company with 51% shareholding from

³⁷ Giovanni Dell' Ariccia, Asymmetric Information and Market Structure of the Banking Industry, IMF Working Paper, WP/98/92, June 1998, available at <https://www.imf.org/external/pubs/ft/wp/wp9892.pdf>

³⁸ Section 2(21): (21) "information utility" means a person who is registered with the Board as an information utility under section 210;

Section 210: Registration of information utility.

³⁹ The National E-Governance Services Limited, details about the board of NeSL available at <https://nesl.co.in/the-board/>

⁴⁰ Regulation 3, IU Regulations, 2017

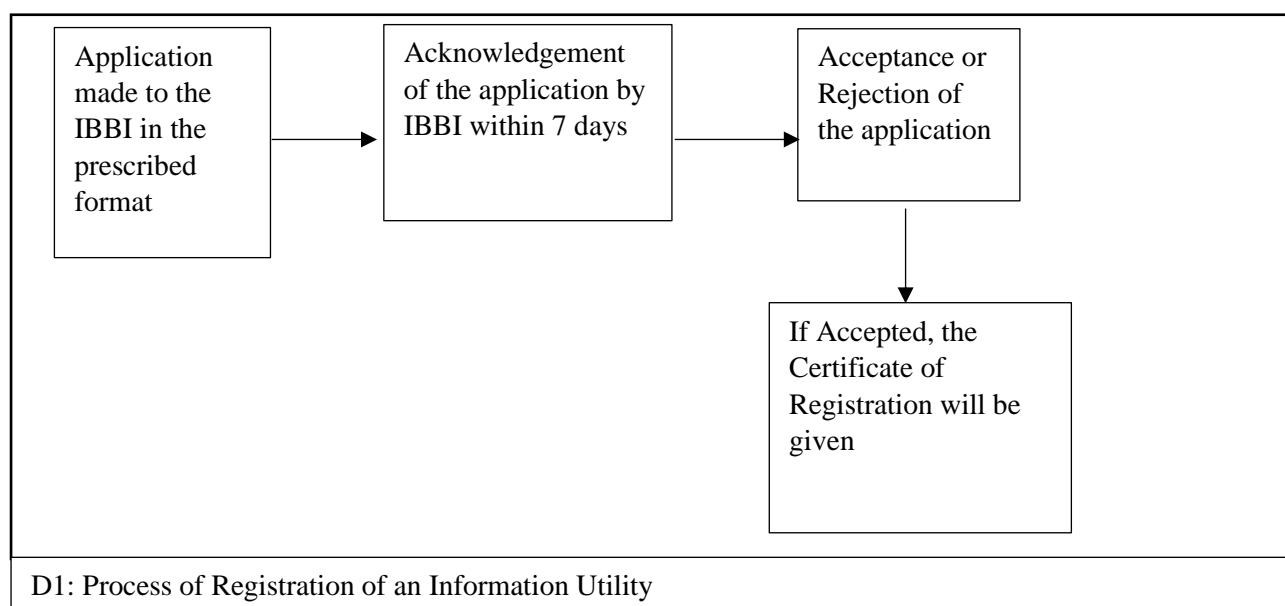
⁴¹ Regulation 8, Chapter III of IU Regulations, 2017: Shareholding includes individual, Person acting in concert, directly or indirectly in the total voting or equity stake.

⁴² Regulation 3(g), IU Regulations, 2017.

government or government owned institutions with requisite paid up share capital.⁴³ Each of the shareholders have kept their shareholding under 10% except for Bank of Baroda which has 14% stake on account of merger of Vijaya and Dena Bank⁴⁴ in view of the legislative capping mandated in the 2017 regulations⁴⁵. It is noteworthy that all the shareholders in the Information Utility are either Banks, Financial Institutions or Insurance companies as enumerated in Annexure- I. There is requirement of a governing board with a managing director, shareholder director and independent directors. This requirement is an extension of the requirement of the board composition in the Companies Act, 2016.⁴⁶

Registration Process

It is pertinent to note that section 210 provides for the general guidelines w.r.t process to be followed while registering an Information Utility which indicates that an application be made to the regulator in accordance with rules laid down in IU Regulations, 2017 which must be acknowledged by IBBI within 7 days. The IBBI then must intimate the applicant of a rejection within 45 days else approve the application and provide a certificate of registration. The process is as depicted in the diagram D.1



⁴³ The compliance report of 2019-20 submitted by NeSL to IBBI available at <https://nesl.co.in/wp-content/uploads/2020/12/Annual-Compliance-Certificate-2019-20.pdf> ; As per Regulation 8, Chapter III, Insolvency and Bankruptcy Board of India (Information Utilities) Regulations, 2017

⁴⁴ Press Trust of India, Bank of Baroda concludes three-way amalgamation with Dena, Vijaya banks, https://www.business-standard.com/article/pti-stories/bank-of-baroda-completes-integration-of-erstwhile-dena-vijaya-banks-with-itself-120122000502_1.html#:~:text=In%20a%20first%20three%2Dway,Baroda%20from%20April%201%2C%202019.&text=%22We%20have%20successfully%20completed%20integration,faced%20under%20the%20COVID%20environment, Accessed on 10th May, 2021

⁴⁵ As per Regulation 8, Chapter III, IU Regulations, 2017

⁴⁶ Section 149, Companies Act, 2013

Any interested person or entity is allowed to make an application⁴⁷ for registration with the Insolvency and Bankruptcy Board of India requesting for registration as an Information Utility alongwith a prescribed fee of INR 5,00,000⁴⁸. The application requires various particulars to be disclosed over and above the business plans, shareholding pattern, capital, exit management plan etc., the technical standards viz: the technical sturdiness of the organisation in terms of technology to be employed, data security, facilities for housing data centre and method in place for grievance Redressal.

This information according to Rule 5 will help the Board decide whether or not the registration shall be granted to the applicant. Incase of rejection the Board is mandated to inform the applicant within a period of 45 days from the date of receipt of the application. It has further been highlighted that the Board may allow the applicant to either clarify or rectify any of the deficiencies in the application whereby the registration could still be granted. However, in case any such clarification is sought, it will be excluded from the rejection time frame provided by the rules.

Once the application is accepted and the registration has been granted the Information Utility applicant will be required to make a payment of INR 50 lakh as annual charges. Once registration is complete the Information Utility is duty bound to follow the rules and regulations as identified within the Code as well as the rules. It is further required to be noted that the Board will have to kept informed of any material changes taking place within the registered Information Utility as it may have significant repercussions on the continuance of registration of the Information Utility.

There shall be a Grievance Redressal committee which will look into the complaints by the users as well as the board of governors. Having discussed the features of the Information Utilities the next segment will discuss the functions of the process followed by Information Utility.

3.4. **Process followed by Information Utility**

The role of Information Utility is to collect, collate and disseminate information amongst the stakeholders with a view to provide transparency within the credit ecosystem. Since it's a new

⁴⁷ Rule 4 of the IU Rules: as prescribed in Form A.

⁴⁸ Rule 4: Non- refundable fee of INR 5 lakh

set-up the operational modalities as listed in the rules and regulations can be understood in the following categorisation:

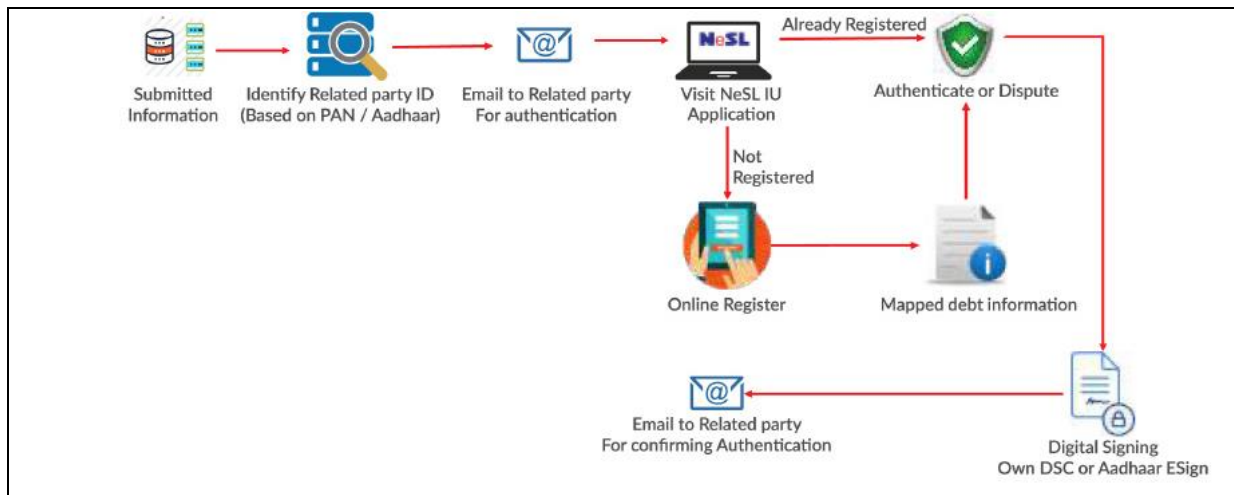
- (a) Registration of Users
- (b) Creation of Unique Identifier
- (c) Submission of Information
- (d) Verification of Information
- (e) Data Integrity
- (f) Consent framework for sharing information

It has been further provided within the Rules that the Information Utility must abide by a set of technical standards as highlighted within the Code by Regulation 13. These regulations may pertain to the Application Programming Interface, terms of service, registration of users along with method for unique identification for each record and each user, submission, verification and authentication of information and stakeholders, data integrity and security including systemic security and consent framework for providing access to information to third parties. It is pertinent to note here that the rules allow every entity desirous of becoming an Information Utility to frame its own technical methods and standards while remaining under the overarching rules established under the Code and the IU Regulations.

The underlying concept of working of Information utility

NeSL has on its website explained working of Information Utility as an institution which stores verified and authentic financial data from the stakeholders. The first step is registration of users on the IU portal using electronic authentication in form of digital signatures/adhaar authentication etc. which creates a unique id and a system account for storage of financial information. Once registration is complete the stakeholder can at anytime submit any financial information on the portal through the unique Id and account so created. The financial information so submitted will then authenticated by the IU by sending confirmatory emails to the concerned stakeholders. Once the concerned stakeholders confirm the information so submitted is classified as verified and authenticated. Any information that is not verified by the authenticating party is given a deemed authenticated certification after three unanswered reminders to the counterparty.⁴⁹ The process has been pictographically shown in D.2 and each of the stages have been discussed below in detail.

⁴⁹ Regulation 8, NeSL Bye-laws available at <https://nesl.co.in/wp-content/uploads/2020/11/Amended-NeSL-Bye-laws-wef-23-11-2020.pdf>



D2: Functioning of an Information Utility

Registration of Users

NeSL mandates that each user will register with the Information Utility and pay the requisite fee.⁵⁰ Thereafter the registered user will submit requisite identification documents in order to ensure that there is no duplication of registration. For this purpose, it is pertinent to note that once the system generates a clearance report about the user seeking registration, a unique identification number is generated. For this purpose the de-duplication exercise will not be limited to NeSL alone but all the Information Utilities that exist in India, thus inter-connected IU services have been envisioned.

Once the registration and unique identity generation have been completed an authorised representative a unique identifier⁵¹ of the registered user is enabled to carry out the functions of supplying and examining information. Since the process is completely electronic digital signatures, adhaar based e-sign ins are envisaged to help evaluate and authenticate the financial data so provided. In this process the email id and mobile phone verification of the authorised representative shall also be used thereby allowing for direct connect, contact and accountability. There may also be server based credibility checks since it is used for data storage and identification. There shall be continuous monitoring of financial data and information shared by the user in order to ensure authenticity of the process.

⁵⁰ Regulation 4, NeSL Bye-laws available at <https://nesl.co.in/wp-content/uploads/2020/11/Amended-NeSL-Bye-laws-wef-23-11-2020.pdf>

⁵¹ Regulation 5, NeSL Bye-laws available at <https://nesl.co.in/wp-content/uploads/2020/11/Amended-NeSL-Bye-laws-wef-23-11-2020.pdf>

3.5. **Supply and Verification of Information**

The bye-laws state that the financial information shall be supplied by the registered user in the prescribed format⁵² i.e. form C which would be in pdf version, scanned pages or others as specified by the information utility. The debt information is to be accompanied by security details as well as third party connections to the debt in question. The documents and information on default can be submitted at any time by the registered user provided it has the unique identifier stamping and is supported by the digital signature already registered and verified by the IU.

NeSL has in its rules stated that the financial information can be submitted in multiple modes of covering batch upload of multiple records (e.g. manual upload of file or automated server to server file transfer using Simple Object Access Protocol based API service or push from creditor's server to a designated Secure Shell File Transfer Protocol server) or even screen based entry of one record at a time.⁵³

Once the information has been supplied NeSL mandates acknowledgements of the receipt of such data. It also envisions that a default may be intimated by the creditor in the same manner as prescribed above and NeSL may make use of data stored with the Ministry of Corporate Affairs in order to verify the default claimed by the creditor apart from verification from the debtors themselves.

Once the information pertaining to default by the debtor has been received the Information Utility would communicate the status of authentication to the registered users, i.e.:

- (a) creditors of the debtor who has defaulted, and
- (b) parties and sureties, if any, to the debt in respect of which the information of default has been received.

After receiving the financial information, the IU will proceed to verification stage by sending the information shared by the user to the other counterparties. The other counter-parties may within the stipulated time either verify, dispute or maintain silence over the information shared with them. If the debtor responds agreeing to the debt, it stands verified and in case of any default may be used as a valid record of evidence before the adjudicating authority. However,

⁵² Regulation 6, NeSL Bye-laws available at <https://nesl.co.in/wp-content/uploads/2020/11/Amended-NeSL-Bye-laws-wef-23-11-2020.pdf>

⁵³ Regulation 6, NeSL Bye-laws available at <https://nesl.co.in/wp-content/uploads/2020/11/Amended-NeSL-Bye-laws-wef-23-11-2020.pdf>

in case the debtor responds in the negative the Information Utility will flag it as a problematic case and colour code it red as depicted below:

<i>Table Sl. No.</i>	<i>Response of the Debtor</i>	<i>Status of Authentication</i>	<i>Colour of the Status</i>
1	Debtor confirms the information of default	Authenticated	Green
2	Debtor disputes the information of default	Disputed	Red
3	Debtor does not respond even after three reminders	Deemed to be Authenticated	Yellow

It is further pointed out that NeSL plays no role in case a dispute between the parties w.r.t debt occurs in terms of settlement of the issue, and the parties will have to settle the dispute separately. It is further indicated that in case of silence from the verifying parties NeSL will have no power to compel verification by the counter party. However, NeSL has the power to categorise cases either as verified, disputed or non-responsive allowing for future amendments to the information so submitted.

The manner in which NeSL bye-laws have been drafted it indicates that there is a presumption that only debtors responses are going to be material in the sense that only they will be asked to verify the information and not vice-versa. This presumption coupled with shareholding pattern is likely to generate immense trust deficit in the eyes of members of industry in general and corporate debtors in particular, there is thus a greater need to ensure transparency of the system.

3.6. **Data Integrity**

As the name suggests an Information Utility is a repository of financial information and any compromise with the integrity of the data can jeopardise not only the future of the corporate debtor but also the integrity of the entire the Information Utility, it is thus imperative that an immutable and tamper proof system with robust data recovery mechanism that can neither be hacked nor destroyed nor result in incorrect verification of data be established. There is thus a need for robust capacity planning policy as envisioned within the rules laid down by the IU regulations.

As per the NeSL bye-laws data integrity would include security of the system, security of information and storage of information. It is pertinent to note that NeSL is mindful of the threats that may arise in case of collecting, storing and using financial data in electronic form and thus

proposes that there shall be appropriate mechanisms in place to ensure that breach of storage facilities and servers is avoided by using adequate technological devices etc. It categorically highlights that systems in place would be sufficiently advanced so as to be able store, collate and disseminate the financial data without fear of any compromise or misuse. For this purpose the system envisioned is to have multi-tier security features with access restricted to only authorised personnel. In order to fight the vulnerabilities of being internet run, sever based, electronic digital data manager secure coding standards will be put in place to ensure highest level security of the financial data in possession of NeSL. As part of further protection secure data access shall be enabled through *sftp*⁵⁴ for bulk transfer and https for browser based access and network security shall be enforced using Firewall, Intrusion Detection/ Protection System, Antibot, Antivirus/ Anti malware/ Anti-Spam etc. NeSL aims to use operational standards such as Uptime Institute's Tier standards alongwith ISO 27001 certificate adoption. In order to ensure sovereign rights over the data including intellectual property etc. all the financial data so collected by NeSL would be stored in Indian Servers having exclusive jurisdiction of Indian regulators and authorities. The NeSL also seems to have put in place the Disaster Recovery Business Continuity Plan to ensure recovery and protection of data in case of unauthorised access.

In a significant move the NeSL has announced that it will keep the position of Chief Technology Officer separate from that of Chief Information Security Officer. In addition to the above there is also a discussion w.r.t risk management, purging and managing of information. It is imperative to point out that the bye-laws indicate information sharing on consent basis between the debtors and creditors, insolvency professionals, the adjudicating authority and the regulators.

The technology employed by NeSL is presumed to have been tested as a usable, scalable, set-up suitable for data collection, collation, analysis and dissemination, yet it does not inspire confidence. The system as described above indicates itself as yet another database where information is added without any modicum of transparency, efficiency and efficacy in ensuring data transparency, immutability and confidentiality as visible tenants for stakeholders to develop confidence. The system needed for a functionally effective Information Utility must

⁵⁴ Secure File Transfer Protocol: A secure method using encryption and cryptography used for transferring bulk files over the internet. The system allows access only via server authentication thus securing content from unauthorised and middlemen based attacks.

be founded on continuous connect and sharing of real time information between the stakeholders with no party suffering on account of skewed information.

3.7. **Function of the Information Utility**

As discussed above the role of Information Utility is to function as a depository of financial information for the benefit of the credit economy. In this regard the Information Utility's function have been defined as core functions and other or ancillary functions required to be carried out for the purposes of the helping or aiding the core functions.⁵⁵

As per the Code the core functions that the Information Utility is supposed to perform⁵⁶ have been identified in section 2(9). The core functions include:

1. accepting electronic submission of financial information in such form and manner as may be specified;
2. safe and accurate recording of financial information;
3. authenticating and verifying the financial information submitted by a person; and
4. providing access to information stored with the Information Utility to persons as may be specified.

In the same narrative it will be worthwhile to analyse the definition of financial information as defined under section 2(13) of the Code. The provision lists the following as financial information for the purposes of the Code. These have been further clarified by the IBBI in its information brochure⁵⁷ w.r.t Information Utilities:

- (a) records of the debt of a person;
- (b) records of liabilities when a person is solvent;
- (c) records of assets of a person over which security interest has been created;
- (d) records, if any, of instances of default by a person against any debt;
- (e) records of the balance sheet and cash-flow statements of a person, and
- (f) such other information as may be specified

It can thus be safely stated that the law envisions the financial information of the nature of debt of an entity in a manner that permits evaluation of debt payments a comparative assessment of

⁵⁵ Rule 17, of the Regulations

⁵⁶ Section 213 of the Code. Rule 17 of the Rules.

⁵⁷ Information Utilities: A Key Pillar of Insolvency Proceedings Information Brochure, 30th November, 2020, IBBI, <https://www.ibbi.gov.in/uploads/publication/ee64e0a0330c81c11c0ab538b5e4b946.pdf>

the extent of defaults and at the same time ensures that no other information is either sought or supplied. Further, in the landmark judgment of Swiss Ribbons the apex court clarified that the information stored with the Information Utility is an evidence of default by the corporate debtor and the judicial authorities are empowered to rely on it as part of evidence.

It is worthwhile to note that the Code does not provide the timeline w.r.t to the supplying of information. There is no clarification as to the stage at which a commercial entity will share its credit and debt information with the Information Utility thus allowing for a loophole where just before the default is known a tampered statement of financial information may be supplied which may lead to incorrect information being stored on the system further amplifying the dispute between the creditor and the debtor. It is pertinent to note that a dispute at this stage would derail the entire Insolvency Resolution Process by not only overshooting the time lines but essentially causing a trust deficit in the system thus created.

It is thus imperative that a technologically sound solution be found in order to avoid such manipulation of financial data.

3.8. Obligations of an Information Utility

As per the law the information utility is obligated to set up a viable infrastructure in order to be able to perform the functions that they are required to perform. The Code⁵⁸ has broadly highlighted the obligations to include establishment of an inter-operable, reliable infrastructure meeting requisite technical qualifications, wherein financial information will be stored supplied by people obligated as well as desirous of supplying financial information. There will also be a mechanism whereby such financial information will be supplied to the such persons desirous of accessing it as such according to the rules laid down by the law. The Information Utility will also provide statistical information of the credit and debt status to the Board as per the requirements.

As per the bye-laws created by NeSL the Information Utility will have duties in addition to those mentioned above. These indicate⁵⁹ that the Information Utility shall:

- (a) Hold the information submitted to it by the submitters as a custodian and shall provide services with due and reasonable care, skill and diligence.
- (b) Provide services without discrimination in any manner.

⁵⁸ Section 214, Insolvency and Bankruptcy Code, 2016.

⁵⁹ Rule 16, NeSL Bye-Laws.

- (c) Provide services to a user based on its explicit consent.
- (d) Guarantee protection of the rights of users.
- (e) Establish adequate procedures and processes and facilities to ensure that its records are protected against loss or destruction.
- (f) Adopt secure systems for information flows.
- (g) Protect its data processing systems against unauthorized access, alteration, destruction, disclosure or dissemination of information.
- (h) Transfer all the information submitted by a user and stored with it to another Information Utility on the written request of the user.
- (i) Accept from an IP, reports, registers and minutes in respect of any insolvency resolution, liquidation or bankruptcy proceedings.
- (j) Make adequate arrangements, including insurance, for indemnifying the users for losses that may be caused to them by any wrongful act, negligence or default of NeSL, its employees or any other person whose services are used for the provision of services under these Regulations.
- (k) The Information Utility shall not outsource the provision of core services to a third-party service provider
- (l) The Information Utility shall not use the information stored with it for any purpose other than providing services under these Regulations, without the prior approval of the Board.

4. Analysis of Working of National E-Governance Services Limited

NeSL, the first Information Utility of India incorporated in the year 2017 has in a short span of 4 years registered impressive numbers and the sustained growth is indicative of positive implications for the credit economy and has far exceeded the expectations in terms of value addition to the insolvency process under the auspices of IBC. Given below are some observations w.r.t functioning of NeSL:

- (a) As per the compliance report submitted by the NeSL to IBBI NeSL has 4 promoters: ICICI Bank, State Bank of India, Canara Bank, and Union Bank of India.
- (b) The Shareholding pattern⁶⁰ of NeSL indicates that 12 out of 16 shareholders are Banks which are known to be financial creditors possessing significant Non-Performing Assets as highlighted below:

⁶⁰ Please see Annexure-I

S. No.	Bank	Amount of NPA ⁶¹ for 2019-2020 (Amount in Crore)
1.	State Bank of India	149091.85
2.	ICICI	40829.09
3.	HDFC	12559.38
4.	Union Bank of India	49085.31
5.	Canara Bank	37041.15
6.	Bank of Baroda	69381.43
7.	Punjab National Bank	73478.76
8.	Axis Bank	26604.10
9.	NABARD ⁶²	703.90
10.	Indian Bank	14150.84
11.	SIDBI ⁶³	189.57
12.	Karnataka Bank	2799.93

As a researcher one cannot help but question the rationale behind having only banks which are known to be financial creditors as shareholders in the Information Utility. It is possible that the corporates are likely to feel intimidated by the controlling ownership of the banks over NeSL. It is imperative to point out that there is no representation from the industry whatsoever either individually or through collective institutions viz: ASSOCHAM, FICCI etc. either on the governing Board or in Shareholding indicating that all stakeholders have not been given equal representation in NeSL. This lack of representation in the view of the researcher is likely to create a trust deficit in the minds of corporate debtors as institutionally the system seems to be siding with the financial creditors having the highest record of Non-Performing Assets in India as indicated in Annexure-II Justice should not only be done but must be seen to be done⁶⁴. Equal representation of all the stakeholders is a must.

⁶¹ Statistical Tables related to Banks in India, Reserve Bank of India, 2020, available at: <https://dbie.rbi.org.in/DBIE/dbie.rbi?site=publications>

⁶² Non Performing Assets details, Annual Report, NABARD, 2019-2020 available at: <https://www.nabard.org/auth/writereaddata/Flipbook/2020/Nabard-English-Annual-Report-2019-2020/index.html>

⁶³ Non-performing Assets, Annual Report, SIDBI, 2019-2020 available at: https://sidbi.in/AnnualReport201920/pdf/SIDBI%20AR_PartII_English.pdf

⁶⁴ Lord Hewart CJ, R v Sussex Justices, ex parte McCarthy, KB 256, EWHC KB 1

(c) Registrations and agreements executed with NeSL indicate that the concept is yet to pick up amongst the stakeholders within the corporate economy. It is pertinent to note that Information Utility in general and NeSL in particular has received lot of support from the State run institutions in terms of integrating it with corporate economy. The Reserve Bank of India vide a notification⁶⁵ in 2017 mandated all the Financial creditors registered with it (Scheduled Commercial Banks, NBFCs, Cooperative Banks etc.) to register their debts with the Information Utility. However, the number of registrations with the NeSL do not seem commensurate with the above named efforts. As per the table 1 given below till December 2020 only 284 contracts have been executed between NeSL and financial creditors.

Table 1		
At the end of the year /month	Creditors having agreement with the NeSL	
	Financial Creditor	Operational Creditor
2018-19	174	NA
June 2019	209	NA
Sept 2019	226	NA
Dec 2019	246	NA
March 2020	267	NA
June 2020	269	NA
Sept 2020	276	NA
Dec 2020	284	NA

According to table 2 as on December 2020 a total of 587 financial creditors and 654 operational creditors submitted credit information to NeSL. Further as per the NeSL website as on 31st March 2021⁶⁶ data pertaining to 4.42 lakh defaults measuring to 21,46,448.336 crores as actual default in money terms has been shared.

⁶⁵Submission of Financial Information to Information Utilities, RBI/2017-18/110 DBR.No.Leg.BC.98/09.08.019/2017-18 dated 19th December, 2017, Reserve Bank of India. It states, 1. According to Section 215 of Insolvency and Bankruptcy Code (IBC), 2016, **a financial creditor shall submit financial information** and information relating to assets in relation to which any security interest has been created, to an information utility (IU) in such form and manner as may be specified by regulations.

2. All financial creditors regulated by RBI are advised to adhere to the relevant provisions of IBC, 2016 and IBBI (IUs) Regulations, 2017 and immediately put in place appropriate systems and procedures to ensure compliance to the provisions of the Code and Regulations.

⁶⁶ Data available on NeSL homepage <https://nesl.co.in/>

The NeSL in order to ensure that the process is not misused follows a robust authentication policy and thus also looks records data where loan records have been onboarded, authenticated and verified. As per table 3 it is clearly visible that the loans actually verified by both financial and operational creditors is much less than the loan information that is actually submitted by the creditors. Looking at these numbers there is a discernible emergence of dichotomy in the data that is being shared by NeSL leading to further aggravation of trust deficit amongst the stakeholders.

Table 2		
At the end of the year /month	Creditors who have submitted information to NeSL	
	Financial Creditor	Operational Creditor
2018-19	114	169
June 2019	160	231
Sept 2019	218	297
Dec 2019	321	408
March 2020	381	543
June 2020	456	574
Sept 2020	548	635
Dec 2020	587	654

Table 3			
At the end of the year /month	Debtors whose information has been furnished by		Loans records authenticated by debtors (both FC and OC)
	Financial Creditor	Operational Creditor	Debtors
2018-19	12,66,445	230	13,799
June 2019	25,31,930	570	22,363
Sept 2019	27,37,049	1764	35,621
Dec 2019	29,26,030	2121	68,766
March 2020	65,51,739	6191	1,09,726
June 2020	74,64,854	8336	1,49,533
Sept 2020	82,28,576	8979	1,86,091
Dec 2020	84,88,578	9010	2,02,558

Another confusion that has arisen is w.r.t the method of registration with the Information Utility, as per the Code and the 2017 regulations anyone wanting to access and share information with the Information Utility is only required to register with the Information Utility either via adhaar or through digital signatures, there is no mention of an execution of an agreement. However, NeSL is executing agreements for sharing financial information with various financial creditors. It is to be further noted that NeSL is looking at information only from the perspective of the creditors as depicted in table 3. There seems to be no active mechanism or equality in terms of data being furnished by the corporate debtors. It raises a question as to why data only from financial creditors is being sought without there being a balancing mechanism of calling data from debtors. In view of the researcher there needs to be a mechanism wherein the credit data mapping may be undertaken to ensure that both debtors and creditors have equal representation in the process thereby reducing conflicts emanating out of unmapped financial records.

- (d) It is pertinent to note that Information Utility boasts of significant number of IP registrations⁶⁷ or IP access of information as depicted in the compliance report submitted to the IBBI. However, during the pilot study conducted by the researcher it was found that only a very miniscule percentage of Insolvency Professionals actually knew about existence of Information Utility, fewer knew about its start of operation and only a handful of them has actually accessed the data on NeSL. The researcher interviewed 100 insolvency professionals.

For the purposes of the interview the data of 2800 Insolvency Professionals as available on the IBBI website as updated until 31st March, 2020 was used and individual emails were sent to them seeking their views on the subject and requesting them for an interview. Of these 2800 a total of 147 Insolvency Professionals responded 47 of these shared no or incorrect contact information on account of which the researcher was able to actually interview 100 Insolvency Professionals. The interview schedule has been annexed herewith as Annexure-II.

Given below are the results of the interview regarding existence of Information Utilities contained the interview schedule.

⁶⁷ Registration being made by Insolvency Professionals on the NeSL website are 378

Q1. Do you know about Information Utility's establishment in India?	Yes: 21
So, you do know about NeSL? (follow-up question raised in case of doubt)	Yes: 16
People who knew about start of operations of the IU under name and style of NeSL	
Q2. Have you used Information Utility?	5
IPs with no comments (for most of the questions they claimed to have no knowledge about existence of information Utility and hence felt it was incorrect to make any statement. This was a very strange reply since these questions were factual with only yes and no answers. The researcher has shared the results thereof)	58
Total Insolvency Professionals Interviewed	100



The questioned asked hereinafter pertain to the assessment of sample Insolvency Professionals w.r.t. success of the Information Utility in India.

Q3. What is your view about functioning of Information Utility in India?

About a quarter of the respondents felt it is work in progress and that it is likely to be successful in future while 5% admitted to Information Utility functioning well.

However, in Q3 the researcher was faced a significant dichotomy in terms of responses from the sample population. While in Q2 nearly 58% of the sample reserved comments w.r.t. their knowledge about the functioning of the Information Utility, yet in Q3 63% claimed to know that Information Utility is not functioning. These answers are based on respondents opinion and hence may be subject to individual bias/ or they can be subjective hence any conclusions derived must be treated with care.

Working well: 5 Respondents	5%
Work in progress: 24	24%
No Comment:	8%
Not functioning: 63 respondents	63%

Q4. Do you feel that Information Utility is successful in India?

As noted earlier, a majority of respondents population believes that the IUs have not been successful with a whopping 95% of the respondents firmly of the view that as on date the IUs are not successful as on date and that more time needs to be allowed to Information in order to assess their success or failure.

Successful: 5 Respondents	1%
Work in progress:	4%
Not successful: 95 respondents	95%

Q5. Do you feel that NeSL has brought about the information symmetry as promised by the Insolvency and Bankruptcy Code of India? Information symmetry per-se has different connotations for the stakeholder as was witnessed during the interviews by the researcher. Information Symmetry within credit economy is nothing but a utopian desire to be achieved in view of the academics which sadly seldom transpires practically in the real-world economics. While this question has received a unanimous negation, the thought that it could someday be a reality in terms would be the highest echelon of success and greatest honor bestowed over information utility as it would be a feat achieved by no other financial institution in the world. The negative response to this question should not be taken as a feedback or reflection on the functioning of the Information Utility and or NeSL.

Successful: 0	
Not successful: 100 respondents	100%

The data above does not present a very positive picture in terms of success of the Information Utility. From the data it is clear that only about 21% of the respondent Insolvency Professionals are aware of the existence of the Information Utility with only 5% actually using the services

of the same. Nearly 63% of the respondents are of the view that Information Utilities are not functioning in India and a whopping 95% IPs are of the opinion that the Information Utility is not successful in India. A unanimous verdict has been declared that NeSL has not brought about the information symmetry as was envisaged in the Code.

These numbers clearly indicate that the amount of work done by NeSL for popularising the concept of Information Utility is insufficient and more work is required to be carried out. While there can be numerous reasons for the dismal numbers it is clear that Information Utility in general and NeSL in particular have failed to generate the desired interest and trust in their institution.

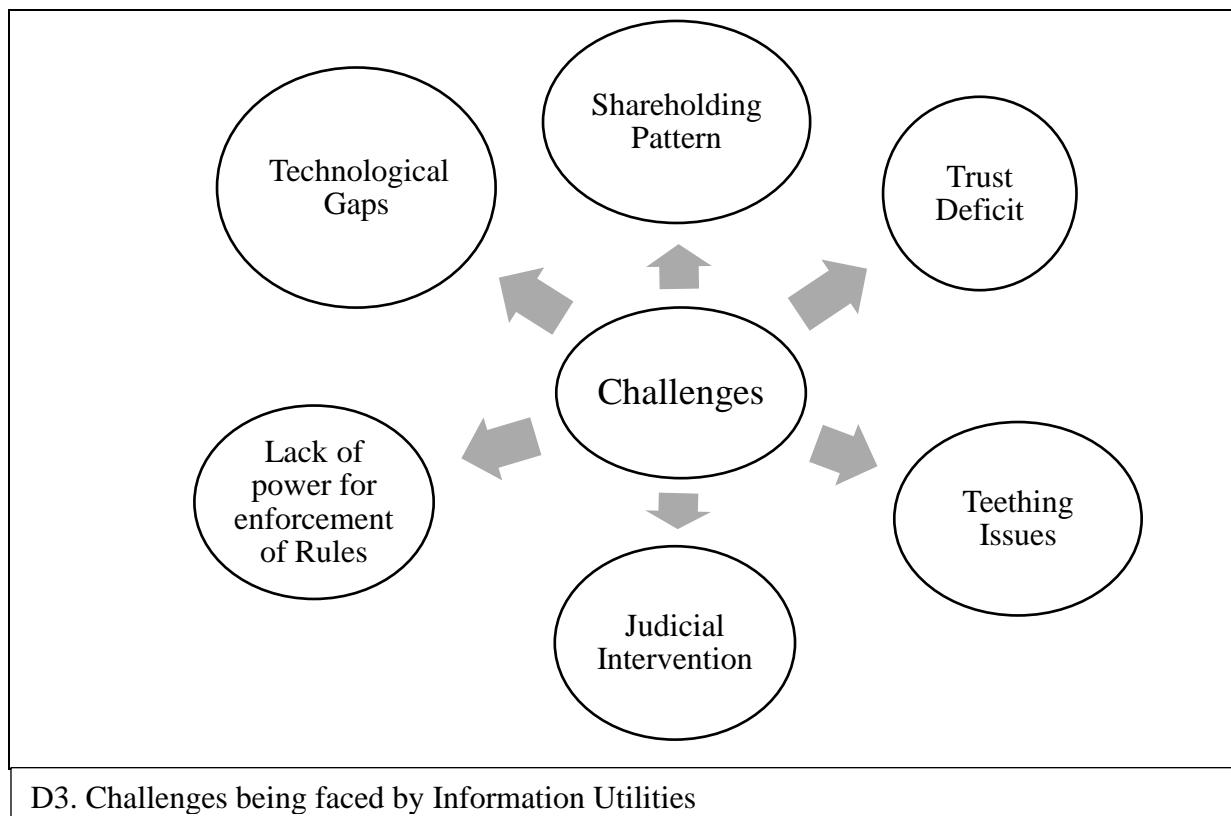
Lack of popularity can also be on account of trust deficit in the minds of the stakeholders not being limited to Insolvency Professionals but also financial and operational creditors including the corporate debtors, considering that the financial information being shared is both sensitive and confidential having significant ramifications for the existence and survival of the companies/corporate debtors and creditors. With stakes being higher the Information Utility will have to figure out a method to reduce the trust deficit. It is thus the need of the hour to reduce the trust deficit and improve their functioning in order for the concept to survive in letter and spirit.

- (e) It is commendable to note that the NeSL has introduced newer concepts for enhancing digitisation of financial, loan, and security documents with the help of Application Program Interface(API), Digital Documentation Execution(DDE), and Platform of Distressed Assets(PDA) respectively. These initiatives are intended to enhance use of smart contracts allowing for digital automation of loan records, easing of functions for asset reconstruction companies and liquidators permitting efficient resolution of insolvencies in the credit economy of India.

It is the case of the researcher that the Information Utility though a good concept has failed to generate the requisite trust, confidence and support from the very stakeholders it is meant to cater to thereby threatening the very survival of the Information Utility. It is this threat that NeSL needs to address. This paper has made a suggestion as to how the threat can be neutralised simply by changing the technology employed which can reduce the trust deficit and improve confidence in the systems.

5. Challenge to working of Information Utility

From the above discussion it is clear that Information Utility in general and NeSl in particular are in nascent stages of development and are thus faced with various challenges. While some of these can be ironed out as being teething issues others are structural and implementation challenges that need rectification or whole scale modification within the legislative setup. The challenges can thus be depicted pictographically as below



(a) Lack of clarity on technique used

Based on the information provided by the Insolvency and Bankruptcy Board of India and the sole Information Utility in India-NeSL there is no clarity in terms of the method that the organisation will use to store, authenticate, verify and disseminate the financial information supplied by various stakeholders. The IBBI Regulations and the NeSL bye laws state that digital signatures must be used for verification of data providers and data seekers. As per the compliance report submitted by NeSL for the year 2019-2020 ending on March 31, 2020 the

NeSL⁶⁸ has developed an in-house software for storing and collecting data using a JSON⁶⁹ known to be a lightweight format used for storing and transporting data.

NeSL is mindful of the vulnerabilities of being internet run, sever based, electronic digital data manager and will thus ensure that secure coding standards be put in place to ensure highest level security of the financial data in possession of NeSL. As part of further protection secure data access shall be enabled through *sftp*⁷⁰ for bulk transfer and https for browser based access and network security shall be enforced using Firewall, Intrusion Detection/ Protection System, Antibot, Antivirus/ Anti malware/ Anti-Spam etc. NeSL aims to use operational standards such as Uptime Institute's Tier standards along with ISO 27001 certificate adoption.

Keeping the terminology and technological jargon aside, the NeSL bye- laws, compliance reports etc., do not inspire confidence in the stakeholders as to how their precious financial data will be stored. W.r.t technical standards there are some variations in the bye-law declaration and the compliance report detailing of the technology used by NeSL. Yet there is no explanation as to who can access the information, when can it be accessed and to what extent would it be shareable.

As a lay person with no knowledge about technology the researcher understands that NeSL expects the stakeholders to register on the portal using digital/electronic signatures and or adhaar authentication. Once authentication is completed a profile/account of the stakeholder get created where he/she is allowed to upload and share the data. Once the data is uploaded NeSL sends out automatic emails to the stakeholders for verification where it may or may not be verified and authenticated (a challenge discussed subsequently).

This summation of the functioning of the NeSL's working raises the following questions: -

- i. If the system boasts of being stakeholder friendly then why is all the focus of NeSL on Financial creditors in terms of shareholding and board representation, the detail accounting of agreements executed with the FCs etc. This undue focus on one set of stakeholders to the prejudice of other stakeholders is likely to not only raise questions

⁶⁸ Annual Compliance Certificate of National E-Governance Services Limited, Information Utility (IU) for the year ended 31.3.2020 under regulation 11(3) of the Insolvency and Bankruptcy Board of India (Information Utilities) Regulations, 2017 available at <https://nesl.co.in/wp-content/uploads/2020/12/Annual-Compliance-Certificate-2019-20.pdf>

⁶⁹ JavaScript Object Notation

⁷⁰ Secure File Transfer Protocol: A secure method using encryption and cryptography used for transferring bulk files over the internet. The system allows access only via server authentication thus securing content from unauthorised and middlemen based attacks.

but also create a trust deficit with the remaining stakeholders being understandably worried about the security of their data and position.

- ii. Of the people who register with NeSL who is allowed to access the information stored on the servers of the concerned IU.
- iii. Is it possible for the corporate debtor to be made aware that his financial information has been accessed by someone every time the information is accessed?
- iv. How is transparency of the system to judged or analysed?
- v. Would data access be limited to only those insolvency resolution professionals who are actually engaged in a CIRP process or would it be available en-mass amongst all the insolvency professionals.
- vi. Can there be a mechanism to monitor the working of Insolvency Professionals on the portal and ensure that the data is not being used to the prejudice of the concerned corporate debtor leading to financial ruin.
- vii. What sanctions or punishments can be imposed on erring personnel who access the financial data without authority creating a mischief with the system?
- viii. Even though the servers of NeSL are claimed to be in India for ensuring sovereignty of the data can NeSL claim that there can be global interference and that data integrity can be maintained at all the times.

While some of these questions may seem harsh and even cynical yet it is clear that NeSL is unable to provide any clarification w.r.t the questions raised above either in their bye-laws or in their compliance report. NeSL has only made certain motherhood statements that the data integrity and security shall be ensured, the question of 'how' has not been answered. These statements in the light of recent security breaches, infringement and data thefts from various systems viz: Aarogya Setu App, UIDAI, ICICI Bank. Citi Bank etc. leaves a question as to whether we can blindly trust such blanket statements and claims by institutions in-charge of sensitive financial data.

It is thus the need of the hour to recalibrate the foundational and technological parameters and introduce a more transparent and immutable technique which can restore the balance of trust amongst the stakeholders. It is in this perspective that blockchain technology comes into the picture.

(b) Information verification process is lacking teeth and will nullify the whole process

The Code envisages that both the debtor and the creditor would authenticate the information so supplied on the Information Utility. Since both the parties are authenticating scope for disagreements is likely to be reduced. However, a crucial question that arises is the stage at which the information is to be supplied to the Information Utility. If the information is supplied after the dispute arises there is a possibility that the debtor may not share complete information and the creditor may supply inflated claims. This is likely to further amplify the dispute without any recourse to a viable solution. It is thus suggested that a timeframe be provided within the law itself as to when the information pertaining to credit and debt be uploaded.

In order for the system to be transparent there is a need for systems to be updated regularly rather than at the time when the dispute erupts between the debtor and the creditor. It is thus suggested that the information be shared with the Information Utility in real time i.e. at the time when the debtor avails of the line of credit and the creditor extends it. If this happens there will be a reliable and verifiable data which can at the time when dispute arises be used to authenticate the claims of all the parties/ stakeholders involved. This will also allow for the expeditious culmination of the CIRP process in a time bound manner as envisaged by the Code. In order for this to be successful it is imperative that a technology like blockchain be used so that the real time authentication without human intervention can be conducted saving lots of manhours spent in verifying the financial transactions.

(c) Trust Deficit amongst Stakeholders

As with any new institution, Information Utility is facing significant resistance from the stakeholders who seem to be unaware of the benefits it is likely to bring about as is clear from the challenge to order of mandatory filing of IU certificate as a proof of debt in the case of Univalue Projects v. UOI, as directed by the Calcutta High Court in its 20th August, 2020 order. While resistance from the stakeholders is understandable there is a need for more proactive steps on part of the institution and the regulator to allay the fears of the stakeholders.

The lack of trust also seems to be emanating out of faulty shareholding pattern wherein financial creditors have 80 % of the shareholding, thereby causing reluctance in the minds of industry leaders as to the impartiality of the institution. Secondly, no clarification has been issued as to the stage at which the debtors and the financial creditors can share information

with the Information Utility.⁷¹ This ambiguity can have serious ramifications as sharing of information after dispute eruption may create a bias in the minds of the parties w.r.t genuineness of the claims being made thereby prolonging the dispute and the CIRP process. Finally, it has been found that the technological method followed by the Information Utility contains certain gaps whereby the data discrepancies are visible. Since the technological methodology is not clearly understood and informational gaps are visible the stakeholders are reluctant in using the mechanism.

It is the case of the researcher that the Information Utility is bound to have teething issues and as discussed in the analysis segment some of the challenges emanate out of implementation gaps rather than issues of design as is visible from the Supreme Court verdict in the celebrated case of Swiss Ribbons wherein the court agreed to do away with the requirement of furnishing debt records via Information Utility if any other evidence to the effect existed. The acceptance of resistance by stakeholders to adopting Information Utility by the Hon'ble Supreme Court has further impacted the Information Utility negatively. Certain stakeholders have interpreted this order as the hon'ble judges suffering a trust deficit in the system thereby compounding the very problem they were asked to resolve. It is thus suggested that blockchain technology be implemented in order to address the issues of trust deficit emanating out of opaqueness of the system. Thus, in the next segment the researcher will discuss the concept of blockchain technology.

6. Concept of Blockchain

“Blockchain is to Bitcoin, what the internet is to email. A big electronic system, on top of which you can build applications. Currency is just one.” Sally Davies

Pseudonymous Satoshi Nakamoto first introduced the term blockchain in the wake of 2008 global financial crash in a white paper entitled ‘Bitcoin: A Peer-to Peer Electronic Cash System’⁷². The crash resulted in an extreme trust deficit amongst public in general and stakeholders in particular prompting Nakamoto to provoke a discussion around meaningful societal change through the proposal of an alternative form of financing to run on the digital

⁷¹ One of the reasons for failure of the Credit Information Companies in India was lack of submission of timely reports by banks and other stakeholders resulting in disputes arising on the fundamental question of the amount of debt itself. N.H. Siddiqui report

⁷² Nakamoto, S. (2009), Bitcoin: A Peer-to-Peer Electronic Cash System, <https://bitcoin.org/bitcoin.pdf>.

ledger technology supported blockchain mechanism for all financial transactions in a coordinated network based on trust developed through transparency of the system.

The concept underlying Blockchain technology envisions an environment where a secure trusted network is created for stakeholders to share sensitive information. Blockchain technology though a foundational mechanism builds up on a combination of already existing technologies that help create a low cost computer network for sharing and storing data in a manner similar to TCP/IP the distributed computer networking technology which laid the foundation for the modern day internet.⁷³ The concept of blockchain popularised by the bitcoin⁷⁴, the virtual currency has been built up on the cryptographic technology fundamentally creating a digital ledger using the distributed ledger technology (DLT) establishing immutable databases without any control from a central authority. The system envisions use of consensus protocols whereby no one individual, stakeholder or participant will have the unlimited power over the data allowing for utmost transparency and efficiency of the system.

Blockchain simply put is an accounting book which records transactions after transactions in a manner that no alteration in the original information is possible. The information is stored on blocks that keep getting added (are chained) to the chain in a chronological manner without allowing for modification of any existing information.⁷⁵ In case of any modification or amendment is required an additional block with new information will be added signifying the change yet allowing the participants to view both the original and the amended entries thereby reducing the chances of fraud to zero. The computer network comprises of nodes wherein each node contains datasets encrypted in smaller packets to resemble linear structures or sequences. These sequences are blocks which can then be used by participants to add, integrate and validate information in the most transparent and efficient manner.

⁷³ Marco Iansiti and Karim R. Lakhani, The Truth about Blockchain, Harvard Business Review 95(1):118-127, January 2017: Introduced in 1972, TCP/IP first gained traction in a single-use case: as the basis for e-mail among the researchers on ARPA net, the U.S. Department of Defence precursor to the commercial internet. Before TCP/IP, telecommunications architecture was based on “circuit switching,” in which connections between two parties or machines had to be pre-established and sustained throughout an exchange. To ensure that any two nodes could communicate, telecom service providers and equipment manufacturers had invested billions in building dedicated lines.

⁷⁴ Pilkington, Marc, Blockchain Technology: Principles and Applications (September 18, 2015). Research Handbook on Digital Transformations, edited by F. Xavier Ollerios and Majlinda Zhegu. Edward Elgar, 2016. Blockchain—a peer-to-peer network that sits on top of the internet—was introduced in October 2008 as part of a proposal for bitcoin, a virtual currency system that eschewed a central authority for issuing currency, transferring ownership, and confirming transactions. Bitcoin is the first application of blockchain technology.

⁷⁵ Zetzsche DA; Buckley RP; Arner DW, 2018, 'Blockchain Distributed Ledgers and Liability', Journal of Digital Banking, vol. 2, pp. 296 - 308

Each of these blocks contain the data in the form of mathematical puzzles which can be authenticated only by the node/participant having valid credentials created by way of digital fingerprinting using a hash function constructed cryptographically.⁷⁶ It is pertinent to note that every network contains thematic information which could be topical or entity specific and all the participants work towards validating it thereby ensuring that every participant has all the necessary information pertaining to the network.

Consider the following illustration E1:

When A, the financial creditor tells the network that B a corporate debtor has taken a loan of INR 1,00,00,000 at 5% rate of interest with factory F being mortgaged for the purpose, B will have to validate the same by either agreeing or disagreeing. If he agrees there shall be no dispute, however he may say that the loan taken was only INR 1,00,000 or INR 10,00,000 or the rate of interest was only 2% etc. or that the property mortgaged is not factory F but a house H or a storage unit SU. In either of the scenarios the validity can be checked only from the original loan agreement executed between the parties.

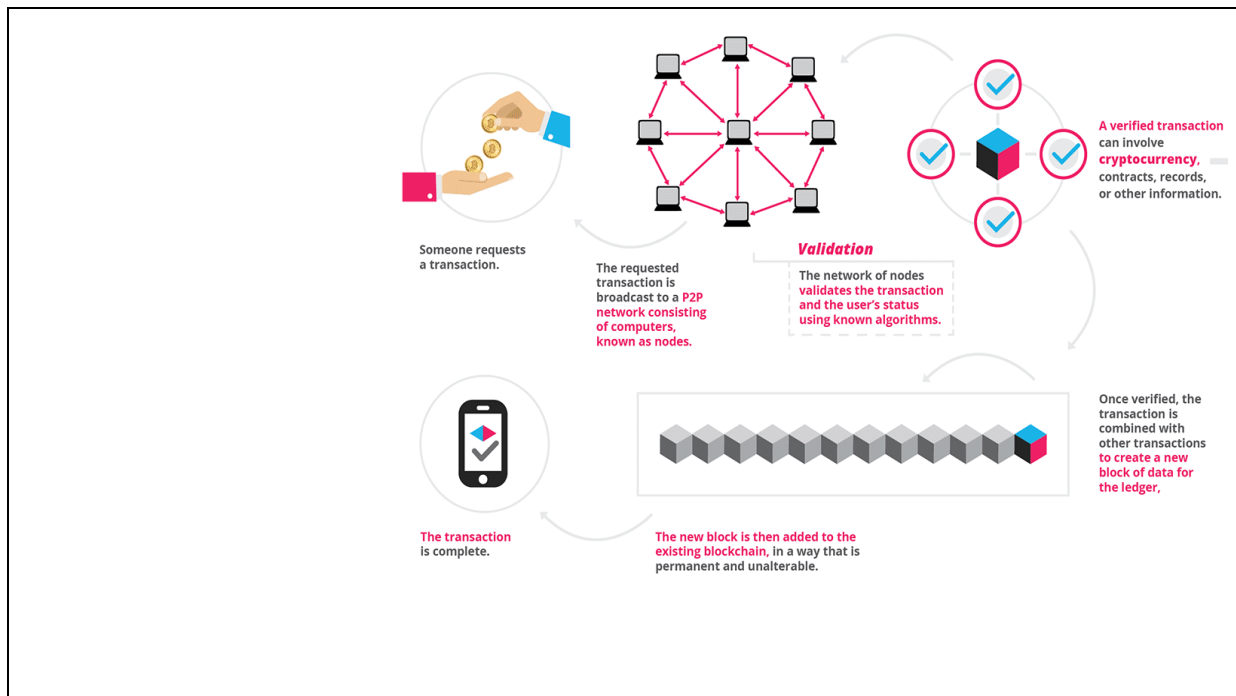
The application of blockchain technology will ensure that neither A nor B at any given point in time are able to refute the existence of the actual debt nor are able to modify any terms in the loan agreement. E1 is an over simplified example but instances quoted by various Asset Reconstruction Companies⁷⁷ indicate that majority of the times absence of original⁷⁸ loan agreements, security deeds, title papers result in disputes delaying the debt resolution process.⁷⁹ Given below in D4 is the pictographic representation of a blockchain.

⁷⁶ Kulhari, Shraddha. "The Midas Touch of Blockchain: Leveraging It for Data Protection." In Building-Blocks of a Data Protection Revolution: The Uneasy Case for Blockchain Technology to Secure Privacy and Identity, 15-22.

⁷⁷ Daniela Klingebiel (2000), The Use of Asset Management Companies in the Resolution of Banking Crises Cross-Country Experiences, World Bank; Stefan Ingves et al., "Issues in the Establishment of Asset Management Companies", IMF Policy Discussion Paper, May 2004, PDP04/03

⁷⁸ The word original here refers to both: the actual terms and conditions as settled between the parties to the contract as well as the real and not fake or forged documents.

⁷⁹ Zwieten (2015), Corporate Rescue in India: The Influence of the Courts, Journal of Corporate Law Studies Volume1, Oxford Legal Studies Research Paper 37/2014



D4: Graphical representation of a general blockchain. Source: Yli-Huumo J, Ko D, Choi S, Park S, Smolander K (2016) Where Is Current Research on Blockchain Technology? —A Systematic Review. PLOS ONE 11(10): e0163477

The unique method of storing data and stamping of information followed in a blockchain ensures that no information is misused or erased to the prejudice of the people as deletion of any information from the ledger will not be possible without allowing all the parties to the transaction to view exactly when, where and by whom the original information was modified or changed or deleted.⁸⁰ This ensures that no party can fraudulently make any changes to the prejudice of other stakeholders. Blockchain technology works as a digital ledger⁸¹ which ensures authenticity of the information that has been shared over peer-to-peer networks by all the stakeholders and at the same-time allows equal access to all the financial information by the stakeholders and decision makers.⁸² It is pertinent to note that all the blocks are equally accessible by all the participants of the network ensuring complete information symmetry, the cornerstone of transparency assured by blockchain. Importance of information symmetry in financial transaction cannot be over-emphasised in an era where decisions having far reaching implications for all the stakeholders collectively are taken.⁸³

⁸⁰ Primavera De Filippi, Aaron Wright, Blockchain and the Law The Rule of Code, Harvard University Press, 2018

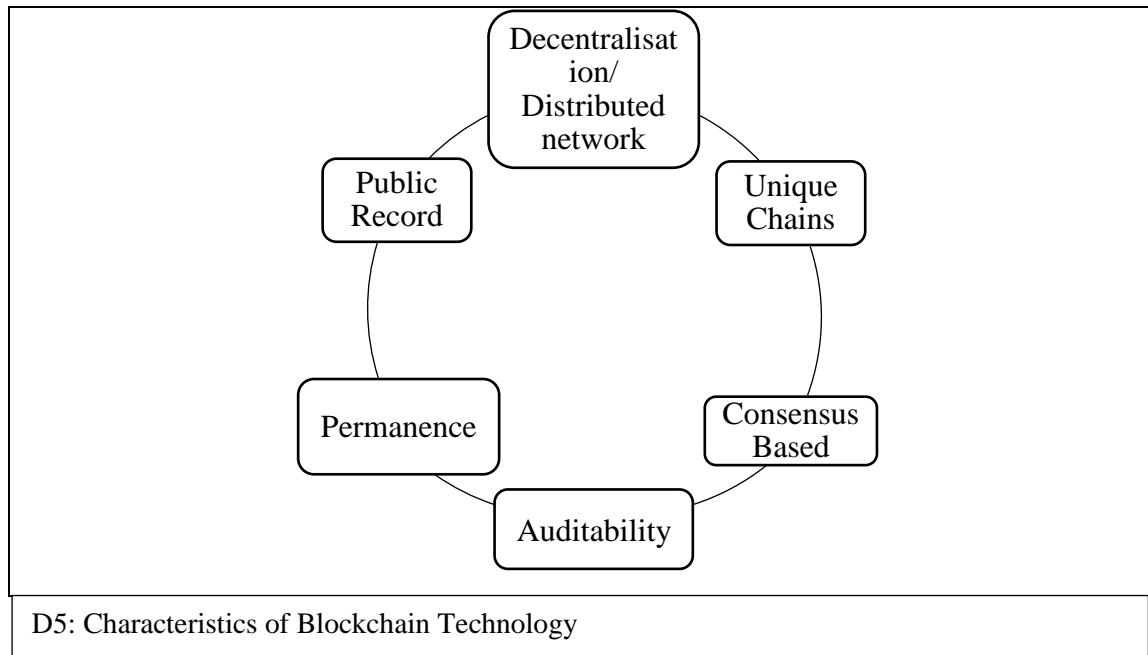
⁸¹ Nakamoto, S. (2009), Bitcoin: A Peer-to-Peer Electronic Cash System, <https://bitcoin.org/bitcoin.pdf>

⁸² Michael Cassy and Paul Vigna, The Truth Machine: The Blockchain and the Future of Everything, St. Martins Press, 2018

⁸³ Kevin Webarch, The Blockchain and the New Architecture of Trust, MIT, 2018

Important characteristics which make blockchain a desirable option have been discussed herein below.

6.1. Important Characteristics of Blockchain⁸⁴



(a) Decentralization/ Distributed Network:

The fundamental logic behind working of a blockchain is that of it being an electronic ledger with the database being connected to all the nodes. The verifiability of data is dependent on all the participants accessing the information and validating it for the benefit of all the participants in the network. Each participant can independently validate, update or correct the ledger in a transparent and efficient manner without having to depend on one authority to do it for them. The validity of the data is thus dependent on consensus and continues voting from other members of the network working in real time to keep the data updated⁸⁵. In a distributed network the consensus algorithm is used maintain data consistency. Blockchain is thus nothing like the traditional methods of data authentication where only one central authority held the rights of verifying the information supplied on the group.

⁸⁴ Zibin Zheng, Shaoan Xie, Hongning Dai, Xiangping Chen, and Huaimin Wang, An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends, 2017 IEEE 6th International Congress on Big Data, 978-1-5386-1996-4/17

⁸⁵ Deep shift: Technology tipping points and societal impact, World Economic Forum, September 2015, weforum.org.

(b) Permanence:

A transaction once recorded on the blockchain cannot be removed, i.e. the block would continue to exist and be permanent.⁸⁶ Any change in data introduced subsequently would be discovered immediately by the other participants. Consider illustration E1, if after a few years of the loan being given the corporate debtor added a block which changed the loan amount from INR 1,00,00,000 to INR 50,00,000 the entire network would immediately discover the change as it would not be compatible with the information shared earlier. The consensus-based network with retrievable memory in the form of information stored in blocks will ensure that no participant is able to unilaterally amend any information. This process also takes away the person centric approach and allows the system to function objectively. The permanence of the records further adds to the advantage of immutability that blockchain promises.

(c) Consensus:

Blockchain technology as discussed above is a consensus-based technology whereby all the participants in the network also referred to as the nodes verify any information shared on the platform for it to receive acceptance. Consider illustration E1, where unless the debtor agrees or validates the creditor's claim that a loan worth INR 1,00,00,000 has been taken at an interest rate of 5% with a factory F being mortgaged, the blockchain will not move. Even though the information can be validated by uploading the original loan agreement, a confirmation from the other party will nevertheless be needed. In blockchain the nodes provide an efficient manner of certifying validity of information shared by one, this consensus-based approach ensures there is transparency without anyone authority/person/entity or group controlling the flow of data by claiming ownership or control.

(d) Auditability:

Linear sequencing and cryptographic technology forming the foundation of blockchain ensures that no transaction is lost in the web of nodes created in the network. Every addition made, deletion requested is trackable, verifiable and auditable within the blockchain matrix. The feature of auditability enhances the blockchain's effectiveness in practical functioning.

⁸⁶ Darcy W. E. Allen, Aaron M. Lane, & Marta Poblet, The Governance of Blockchain Dispute Resolution, The Governance of Blockchain Dispute Resolution - Harvard Negotiation Law Review, Vol. 25., 1, 2019 available at https://www.researchgate.net/publication/340827439_The_Governance_of_Blockchain_Dispute_Resolution_-_Harvard_Negotiation_Law_Review_Vol_25

(e) Public Record

It is pertinent to note that blockchain has been envisioned as a public repository of information allowing for retention of data for any of the interested parties to view at a later stage. This is akin to a data base that may be accessed by a subsequent interested party. Consider illustration E1, where after a span of 5 years the debtor files for bankruptcy and the committee of creditors pursuant to the provisions of the Code announce liquidation of the company. In this scenario an asset reconstruction company ARC is roped in to but the loan of Rs. 1 crore. Thus, ARC becomes an interested party subsequent to loan transaction between the A and B was concluded, making it eligible to access the loan and mortgage papers. The lapse of time would have in no way impacted the original documentation thereby ensuring that ARC is not prejudicially affected subsequent to buying of the loan.

(f) Unique Chains

While blockchains can be created by anyone specially within the public blockchain setup unique chain of blocks is required to ensure trustworthy creations. The validity of the blocks can then be ascertained only by those stakeholders who have access to the unique chain of blocks thus established. The cryptographic generation of hash functions would essentially admit only those with authenticated digital/electronic signatures or software protocols thereby maintaining the sanctity of the process of the data collection and data verification. The uniqueness of the process emanates out of the unique program that is written for each project ensuring that no system overrides, or manipulations take place.

6.2. Types of Blockchains

Blockchain systems as developed over the years have culminated into three categories i.e. Public, Private and Consortium blockchains.⁸⁷ This categorisation is based on the privacy and accessibility requirements of the project for which the blockchain has been created. For a close network where only member of one organisation or sister concerns are required to interact without any outside intervention a private blockchain is more suited in terms of accessibility as well addressing privacy concerns. In a private blockchain there is a pre-selected group of people who are allowed to access and share information on the network. For this purpose, the private keys of the hash function are closely guarded by all the members of the group. There is a misconception w.r.t a private blockchain that it loses its consensus-based approach and is

⁸⁷ V. Buterin, "On public and private blockchains," 2015. Available: <https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/>

controlled only by the organisation on account of fewer people participating in it. This misconception is completely unfounded.

Public blockchain is the most commonly used mechanism where everyone is allowed to see the information. All the participants are allowed to access information and supply the information needed. High number of participants makes verification simpler as information can be easily verified and scope for manipulation of the system becomes near negligible thereby creating a very transparent and effective mechanism.

Growing popularity of blockchain has resulted in growing research and creation of a consortium blockchain wherein the private and public blockchain can be compressed to begin with pre-selected members to a group and subsequently add more and more members with increasing number of participants to the project. For the purposes of the current paper the researcher recommends use of consortium blockchain in order to ensure that privacy and secrecy of the financial data is not eroded by falling into wrong hands. It is envisioned that the consortium blockchain thus created by the Information Utility would allow scope for expansion with growing number of participants and stakeholders and would also permit creation of blockchains within primary blockchain to accommodate expanding transactions.⁸⁸ Having suggested the use of blockchain it is pertinent to discuss the fundamental features used in the blockchain process which would make adoption of blockchain to Information Utilities worthwhile.

6.3. **Process working of Blockchains**

Blockchain as discussed above functions on trust created between the nodes on a network w.r.t. authenticity of data being shared via cryptographically generated hash functions allowing storage permanency of the data concerned. In a blockchain mechanism certain proofs and evidence are required to be shared in order to be able to prove the authenticity of the data being shared. These are proof of work, proof of existence, and proof of stake.⁸⁹ Proof of work as a strategy is used to validate the work of each node and the fact that consensus is freely given. In simpler terms it would mean that cogent evidence would be required to be placed by the

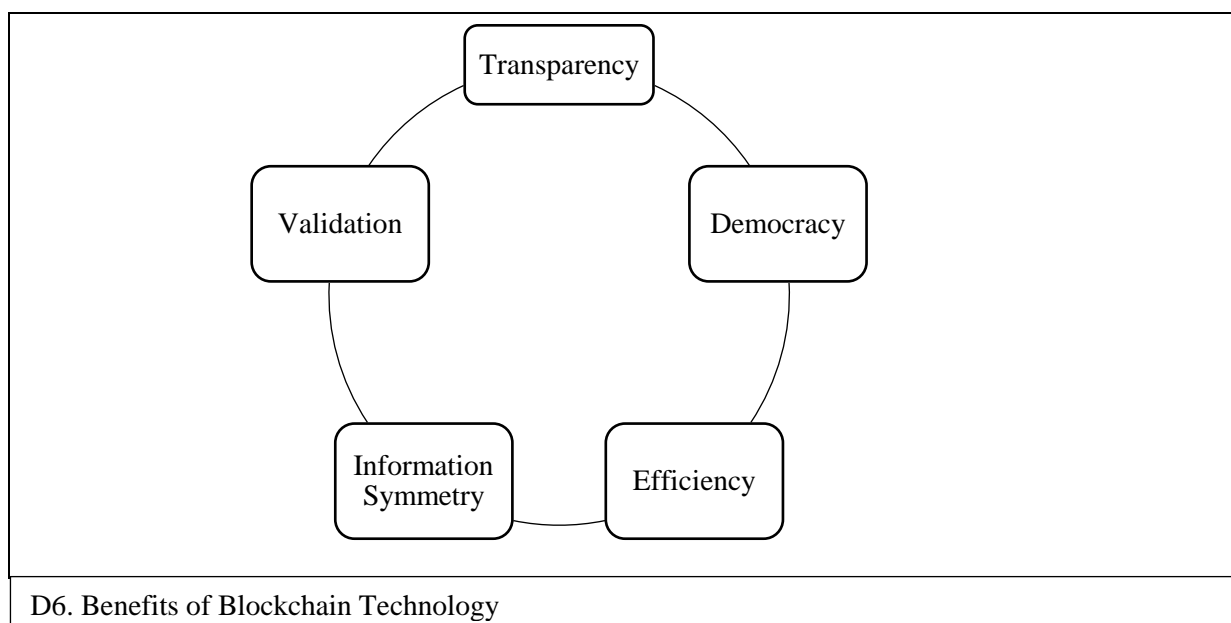
⁸⁸ Philip Boucher,, Susana Nascimento, Mihalios Kritikos, How blockchain technology could change our lives, Science and Technology Options Assessment, European Union Parliament, 2017

⁸⁹ When reading the technology manual on the subject, the proof is associated with the byzantine tolerance protocol and thus also includes the PBFT i.e. Practical Byzantine Fault Tolerance. This concept has not been discussed in detail as in view of the researcher this paper is not the correct forum for such a discussion.

information sharers as well as information validators before the members of the network indicating their source of information. Only when all the participants agree to the information so shared would it become part of the network acquiring the status of permanence and immutability that blockchain promises. Proof of existence on the other hand ensures that the nodes are actually stakeholders having an interest in the transaction and the network and are not robots waiting to grab the information for selfish or prejudicial purposes.⁹⁰ Even though there may be anonymity on terms of names at the nodal stage, the fundamental concept of blockchain ensures that identity of all participants is known to all members of the network. Lastly, the blockchain requires proof of stake. Proof of Stake ensures that each node has enough stake in the network so as to be able to work towards protecting it rather than attacking it or using it for selfish short-sighted gains. Once a blockchain receives the confidence that the above mentioned proofs have been secured the blockchain moves ahead with authentication, validation and storage of data in question, thereby creating a trustworthy, robust and permanent database.

6.4. **Benefits of Blockchains**

It is pertinent to note that blockchain offers wide variety of benefits as highlighted below:



⁹⁰ Michael Crosby and others, Blockchain Technology and Beyond, Sutardja Center for Entrepreneurship & Technology Technical Report, Berkeley Engineering, 2015

(a) Transparency:

The biggest advantage of use of blockchain lies in improving the transparency of the system where it is employed. The fundamental functioning depends on each piece of information being made available to all the participants in the network without any prejudice or bias or detriment to one against the other.⁹¹ The connection of blocks one after the other using the cryptographic hash function ensures that all the data is added with the permission of all the participants and is available for evaluation to all.⁹² The system also ensures that no unauthorised addition or deletion of records takes place as no block can be removed from the blockchain owing to its fundamental nature. This system ensures that there is utmost transparency within the system.

(b) Information Symmetry:

In continuation with the benefit of transparency it is pertinent to note that the transparency results in reduction in information asymmetry within the financial data sets thereby allowing informed decision making by the stakeholders. Information symmetry⁹³ is important for smooth functioning of the IBC. An Information Utility with the use of blockchain can thus help reduce disputes between the creditors and debtors with increased information symmetry between the parties.⁹⁴

(c) Efficiency and Effectiveness:

The methodology followed by a blockchain mechanism makes the system of database creation easy and usage thereof efficient and effective.⁹⁵ With increased transparency and information symmetry the network is able to take faster decisions efficiently⁹⁶ using the verified and authenticated information stored therein and available with the nodes. The effectiveness of the system increases with reduced disputes and angularities in terms of financial data usage and storage.

⁹¹ Ehansen, Bullish on Blockchain: Examining Delaware's Approach to Distributed Ledger Technology in Corporate Governance Law and Beyond, 2018, available at <https://www.hblr.org/2018/01/bullish-on-blockchain-examining-delawares-approach-to-distributed-ledger-technology-in-corporate-governance-law-and-beyond/>

⁹² Nuno Crato and Paulo Purulo(editors), Data Driven Policy Impact Evaluation, Springer, 2018

⁹³ Eatwell, J. M, Milgate and P. Newman(eds), 1989, Allocation, Information and Markets, The New Palgarve, London, Macmillan;

⁹⁴ Prableen Bajpai, How Stock Exchanges Are Experimenting With Blockchain Technology, Nasdaq (June 12, 2017, 8:50 AM), <http://www.nasdaq.com/article/how-stock-exchanges-are-experimenting-with-blockchain-technology-cm801802>;

⁹⁵ Bharath, S. T., P. Pasquariello, and G. Wu. 2009. 'Does Asymmetric Information Drive Capital Structure Decisions?' Review of Financial Studies 22 (8): 3211–43.

⁹⁶ Giovanni Dell' Ariccia, Asymmetric Information and Market Structure of the Banking Industry, IMF Working Paper, WP/98/92, June 1998, available at <https://www.imf.org/external/pubs/ft/wp/wp9892.pdf>

(d) Democracy:

It is pertinent to point out that blockchain follows a democratic consensus based method according all the nodes the right to participate in the validation of the data so submitted in the blockchain.⁹⁷ The traditional method of centralised control⁹⁸ over data has not yielded the desired results and over time increased number of intermediaries has resulted in further chaos and confusion thereby often delaying and polluting the final data shared with stakeholders with no mechanism for verifying the validity of the same.

(e) Validation:

The features and benefits discussed above clearly indicate that there is a full proof mechanism for authenticating the genuineness of the data being shared on the network.⁹⁹ The validation accorded to the data remains within the system permanently as discussed above thereby ensuring retention of authenticity of the data so shared. Thus, after transparency, validation is by far the most crucial benefit enjoyed by blockchain technology.

In the light of the above description, it is thus the case of the researcher that blockchain technology will be the best suited mechanism for the enhancing the functioning of the Information Utilities.

7. Why Blockchain

As Professor Makoto Yano¹⁰⁰ of Kyoto University has famously stated that, “*information stored using blockchain technology is absolutely accurate, and unfalsifiable, thus amassing economic value.*” It may be noted that many independent entities contribute to creating a book of permanent data that is absolutely accurate and unfalsifiable. Participation by interconnected yet independent stakeholders helps conducting immediate verification of financial transactions and records.¹⁰¹ Any inconsistency in data can be immediately identified and rectified using the artificial intelligence mechanism supported by the blockchain technology. Thus immutable financial records are created having significant commercial value trust and confidence of all

⁹⁷ Marten Risius & Kai Spohrer, A Blockchain Research Framework, Business & Information Systems Engineering volume 59, pages385–409(2017)

⁹⁸ Ricardo N. Bebczuk, Asymmetric Information in Financial Markets: Introduction and Applications, Cambridge University Press 2003

⁹⁹ Usha Rodrigues, Law and Blockchain, Iowa Law Review, Vol. 104, 2018, University of Georgia School of Law Legal Studies Research Paper No. 2018-07

¹⁰⁰ Makoto Yano, Chris Dai and others, Blockchain and Cryptocurrency: Building High Quality Market Place for Cryptodata, Springer 2020

¹⁰¹ Hoff K., J. Stiglitz, (1997), Money Lenders and Bankers: Price Increasing subsidies in a monopolistically competitive market, Journal of Development Economics pp 429-462

the stakeholders.¹⁰² By making a ledger of data, a blockchain makes it possible to designate the owner of each piece of data, to trade data pieces, and to market them.

Blockchain as a concept has been recently touted as a game-changer likely to have wider implications than what TCP/IP (internet facilities) had at the time of introduction, needless to note that it took more than 30 years for it to find acceptability and recognition. In case of blockchain the adaptability is likely to be higher as an internet based infrastructure has already been created that has strengthened and gained momentum during the COVID-19 outbreak. Niti Aayog¹⁰³, the premier policy making institution headed having the Prime Minister as the ex-officio chairman has in a recent study made an attempt to analyse implication of integrating blockchain technology within India's governance structures viz: land records, direct benefit transfers, medical and insurance reimbursements etc. With the Adhaar-Pan Card and Mobile Trinity complete, further transparency, efficiency and effectiveness can be introduced in the system. Similar view has been echoed by the OECD¹⁰⁴ and the IMF in their recent reports on using blockchains for bettering the governance structures within the countries. Some companies¹⁰⁵ have in their research on the subject categories industries wherein blockchain can be employed on a trial basis without much of disruption and are thus referred to as the fundamental companies more suited to blockchain solutions. These industries have huge database maintenance requirements viz: financial sector with banks engaged in public dealing and mandated to maintain credit and other information of their clients, second most favoured industry is healthcare followed by capital markets and governmental services¹⁰⁶.

It is the case of the researcher that using blockchain technology as a functional base for Information Utilities would enhance its transparency thereby increasing its efficiency and effectiveness. Information Utilities are repositories of financial information of a company as well as financial institutions and may be recipient of confidential information having far

¹⁰² Myers, S. C., and N. S. Majluf. 1984. 'Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have.' *Journal of Financial Economics* 13 (2): 187–221.

¹⁰³ NASSCOM Avasant India Blockchain Report 2019, <https://www.nasscom.in/knowledge-center/publications/nasscom-avasant-india-blockchain-report-2019>

¹⁰⁴ OECD Blockchain Primer, available at <https://www.oecd.org/finance/OECD-Blockchain-Primer.pdf>

¹⁰⁵ Brant Carson, Giulio Romanelli, Patricia Walsh, and Askhat Zhumaev, Blockchain beyond the hype: What is the strategic business value? McKinsey Digital, June 19, 2018 available at <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/blockchain-beyond-the-hype-what-is-the-strategic-business-value>. Last accessed on 12th May 2021

¹⁰⁶ In Governmental Services record keeping in terms of citizenship, taxation documents, beneficiaries of healthcare, education or the vaccination drive during COVID-19 pandemic is of paramount importance. In this scenario where work has been disrupted across board but social services are required to continuously flow will gain a huge impetus if the provisioning of governmental services can be transferred to a faceless, and intermediary free blockchain network which will require no human intervention.

reaching ramifications for not just the company and financial institution but the industry as a whole.¹⁰⁷ In such a scenario data protection ensuring data integrity from network participants and evading unauthorised access would become of paramount importance while maintaining transparency of the system. Blockchain by far seems to be the most appropriate functional tool that an Information Utility can incorporate for enhancing its functional capacities. Blockchain technology is immutable and thus forms the best response to applicability to the Information Utility.

Blockchain's primary value is its ability to deploy cryptographic mechanisms to reach consensus across parties in the ledger. This eliminates the need for a central authority or intermediary, thereby creating a distributed trust system of value transfer. No single entity can amend past data entries or approve new additions to the ledger. Eliminating the need for a central trusted party can increase speed, lower transaction costs, and enhance security in the network.¹⁰⁸

The algorithmic consensus process is the trust agent. Its effectiveness can be further enhanced if combined with the use of smart contracts and digital compliance. This process of disintermediation and decentralization, coupled with increased transparency and auditability, provides for improved efficiency, speed, and cost reduction. Its immutability provides for a verifiable audit trail of any physical or digital asset. Blockchain was first used in the financial services industry, where it has been enabling digital payment systems and remittances as well as testing more complex financial instruments and transactions such as insurance, deposits, lending, capital raising, and investment management.¹⁰⁹ Global payments, trade finance, and automated compliance are some of the most active experimentation domains for blockchain

¹⁰⁷ Lummer, S. L., and J. J. McConnell. 1989. 'Further Evidence on the Bank Lending Process and the Capital-Market Response to Bank Loan Agreements.' *Journal of Financial Economics* 25 (1): 99–122.

¹⁰⁸ International Finance Corporation, Blockchain in Development- Part I: New Mechanism of Trust, July 2017 <https://www.ifc.org/wps/wcm/connect/f3fb0ab2-1c6e-4121-ba34-743f326d4e99/EMCompass+Note+40+Blockchain+Part+I.pdf?MOD=AJPERES&CVID=IS543uj>

¹⁰⁹ DOUGLAS MILLER et al BLOCKCHAIN: Opportunities for Private Enterprises in Emerging Markets, Second and Expanded Edition, January 2019 available at <https://documents1.worldbank.org/curated/en/260121548673898731/pdf/134063-WP-121278-2nd-edition-IFC-EMCompass-Blockchain-Report-PUBLIC.pdf>

today. According to estimates by industry practitioners viz: Deloitte¹¹⁰, IBM¹¹¹, Accenture¹¹² etc. over \$1.4 billion investment have been made in blockchain with more than 2500 blockchain related patent applications. They have also predicted that 80 percent of banks will be initiating projects on blockchain by 2021.¹¹³

Blockchain technology is also being referred to as the disruptive technology ushering the era of 4th Industrial Revolution and is capable of completely redesigning the economic, financial, industrial and global supply chain infrastructures and models.

8. Integration of Blockchain with Information Utility

It is important to assert here that the researcher in no way is challenging the medium of working of the Information Utility so adopted by NeSL as there is no concrete evidence to indicate that the technology employed is at fault for its dismal performance. However, the fact that NeSL has not picked up as a successful Information Utility is undisputed with trust deficit in the minds of stakeholders being the most profound reason. In order for the institution of Information Utility to be successful it is imperative that a mid-term course correction method be adopted. It is the case of the researcher that the blockchain technology be adopted by the NeSL in particular and Information Utilities in general on account of the benefits it accords in terms of establishing a trustworthy infrastructure for financial data collection, storage and dissemination. In today's era where information is a weapon and holder of information is most powerful it is important to ensure that no one institution, authority or individual has complete control or power over it.¹¹⁴ Thus transparency in use and storage of the data is imminent. The

¹¹⁰ Deloitte. 2016. "Over the Horizon: Blockchain and the Future of Financial Infrastructure." <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Financial-Services/gx-fsi-blockchain-deloitte-summary.pdf>.

¹¹¹ IBM Institute for Business Value. 2016. "Fast Forward: Rethinking Enterprises, Ecosystems and Economies with Blockchains." Executive Report Blockchain

¹¹² Accenture. 2015. "Banks Have a \$380 Billion Market Opportunity in Financial Inclusion, Accenture and CARE International UK Study Find." Accenture Newsroom, November 11. <https://newsroom.accenture.com/news/banks-have-a-380-billion-market-opportunity-in-financial-inclusion-accenture-and-care-international-uk-study-find.htm>; Boyle, Gerry et al. 2015. "Within Reach: How Banks in Emerging Economies Can Grow Profitably by Being More Inclusive." CARE and Accenture.

¹¹³ While Covid -19 played havoc with world's forecasts and timelines subsequent sections and annexure III annexed herewith have indicated that various financial and other institutions have attempted to use blockchain in various public transactions.

¹¹⁴ There was a rumour that a certain stock exchange in Australia was trying to sell data of investors at a profit to anyone interested. The rumour was soon quashed and the Australian Government immediately announced the CDR project i.e. Consumer Data Rights, emphasising that the consumers will have a right to control the dissemination of data pertaining to them. <https://www.accc.gov.au/focus-areas/consumer-data-right-cdr-0>. Even

stakeholders need to be given an assurance that not only is their data safe and secure but it is also used in the most judicious manner ensuring that Information Utility as a repository of financial data does not become an all too powerful institution with its chairman effectively controlling the flow, use and dissemination of data. Once blockchain is implemented an IU will be a participant and have an equal right of use and access as any other participant would have making it the only regulator whose existence and acceptance amongst stakeholders would be based on transparency and democracy of operations establishing confidence of highest order within the system.

Blockchain technology fundamentally allows the participant stakeholders to monitor the storage and usage of their data on the blockchain in two stages. As part of stage one it ensures that the data so introduced is timestamped, verified and authenticated for it to be accepted by the blockchain and any change, modification or alteration thereafter would be recorded in a separate block allowing all participants to not only be aware of the alteration but also verify the same. Any unverified alteration will not be accepted by the participants in the blockchain meaning thereby that no unauthorised change to the prejudice of any member in a transaction would be possible, making the system immutable and transparent. In stage two the blockchain also monitors the activity on the blockchain meaning thereby that even the access to the information by one will be recorded for all other members to see that the information has been accessed, in the same breath it is pertinent to note that any unauthorised access or use would immediately alert the participants to take corrective action. This democratisation and transparent mechanism would not only ensure safety of the data but also increase the accountability within the system making all participants accountable since the system is based on equality of ownership.

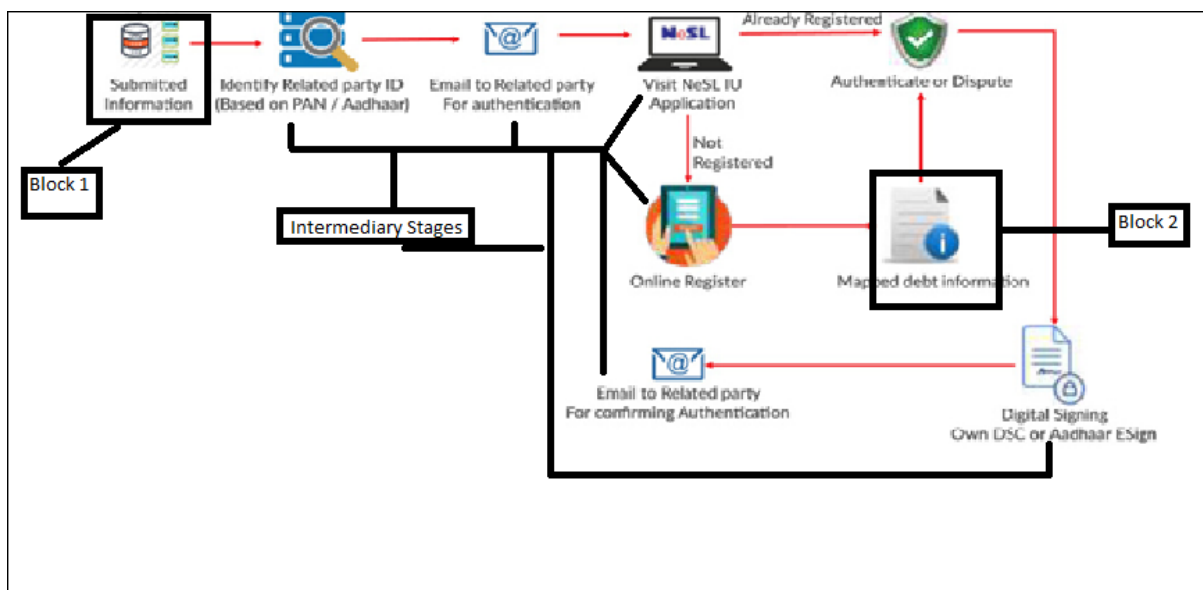
This entire study is based on the question of whether blockchain technology can be employed as a functional tool for Information Utilities. Blockchain technology as discussed earlier is a form of digital ledger most suited to recording of financial data in the most transparent, democratic and effective manner. Information Utility on the other hand is a repository of financial data pertaining to debtors and creditors in order to bring about information symmetry and data service equalisation. It is the case of the researcher that blockchain technology be sued for Information Utility functioning in the following manner as depicted in D3.

though the State took an action the event was an eye opener at the control that the institutions have over the people in terms of personal information and the havoc that would be wreaked if the data were to fall into wrong hands.

Consider the example E1 (discussed above). When A, the financial creditor tells the network that B a corporate debtor has taken a loan of INR 1,00,00,000 at 5% rate of interest with factory F being mortgaged for the purpose, B will have to validate the same by either agreeing or disagreeing.

If he agrees there shall be no dispute. However, he may turn around and say that the loan taken was only INR 1,00,000 or INR 10,00,000 or the rate of interest was only 2% etc. or that the property mortgaged is not factory F but a house H or a storage unit SU. In either of the scenarios the validity can be checked only from the original loan agreement executed between the parties. If this information were to be supplied to be an Information Utility, it would follow the method discussed in diagram D2(discussed above).

However, if one were to use blockchain technology in Information Utility the important information would be stored in blocks named Block 1 and Block 2 with others being intermediary steps as depicted below in D7.

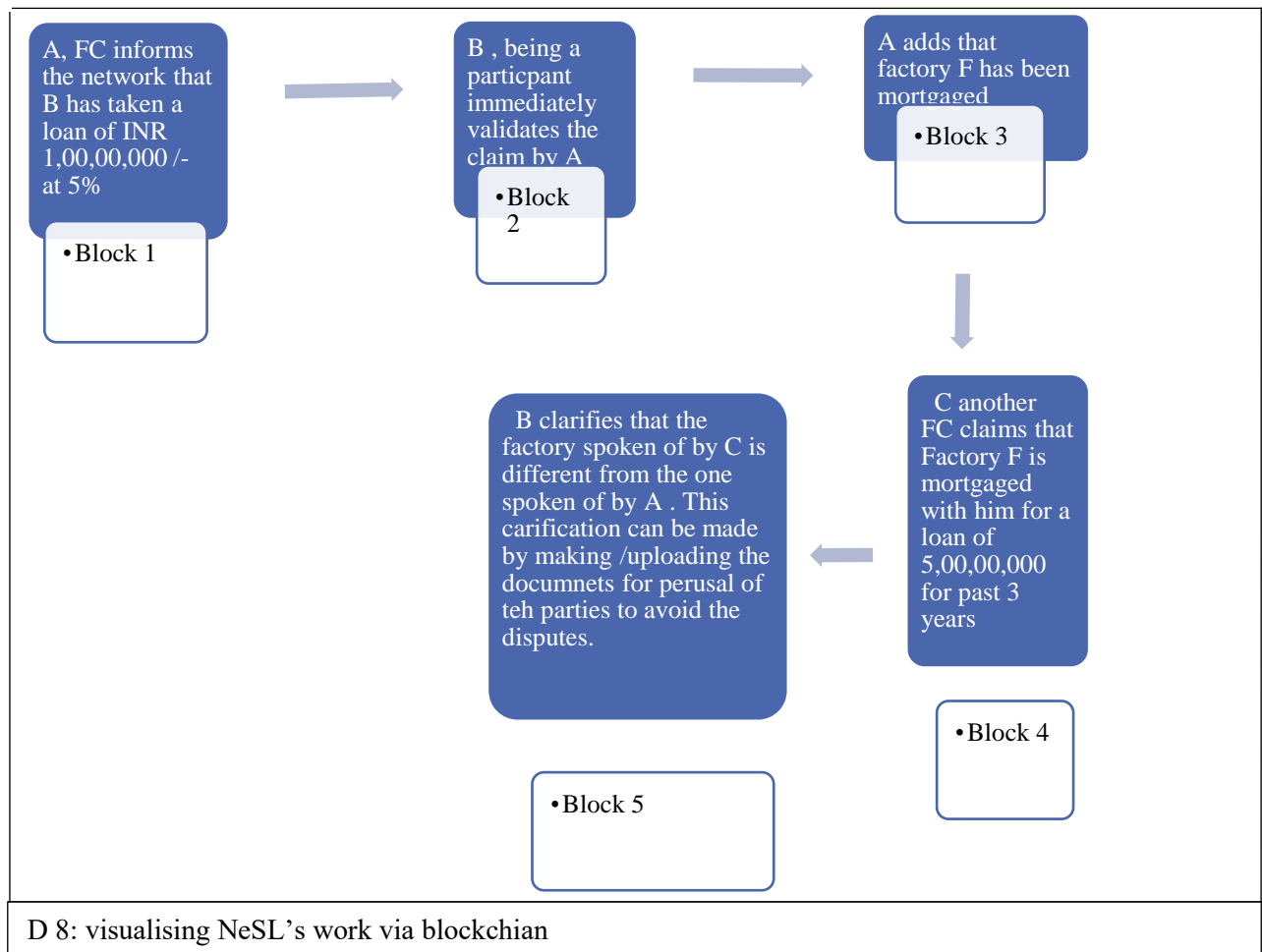


D7: Blocks envisaged over the IU functioning

As seen above the intermediate stages tend to take up much of the time between information sharing and information authentication which is often at the mercy of the counter party who is asked to authenticate and verify the data. As seen while looking at challenges facing the Information Utility that there exists no method to compel the counter party into sharing or authenticating of any data.

In case a blockchain is implemented the first stage would necessarily include bringing all the participants to a transaction together else the entire system will collapse. Once the parties have

registered and are participating nodes any financial information uploaded by one would be amenable to authentication by the concerned counter party without Information Utility having to play a proactive role in the process. The IU can then in true sense be a regulator, regulating the conduct of the parties rather than engaging in the day-to-day squabbles of participants.



Consider the example E1, if we look at NeSL current functioning at every stage NeSL will have to send out reminders (maximum being 3) for the information to be verified and then uploaded on its portal. This would also mean that verified information will be uploaded on each of the accounts that IU creates for all its registered participants. Whereas in case of use of blockchain once the transaction is created any information shared by one participant is immediately known to the other participants in the chain thereby saving lot of valuable time and resources since the intermediary is no longer required to verify or authenticate the additional data so shared on the group.

As and when new information is shared on the group the counterparty with having to wait for an alert or reminder from the Information Utility would be in a position to authenticate, verify

or dispute the data so shared with an opportunity of sharing the supporting documents on the network as well. Looking at D7 w.r.t illustration E1, after block 2 information shared on blocks 3, and 4 are additional which may subsequently become a bone of contention as both A and C have claimed right over Factory F as part of the loan agreement. It is pertinent to note that C made his declaration almost immediately in block 4 immediately after the statement by A in block 3. Only in a blockchain B will have an opportunity to clear the confusion by adding a block 5 immediately and also supplying supporting documents if needed as can be seen D8.

The participants automatically feel compelled to set the record straight without waiting for any alert or nudge from any intermediary or regulator purely with the intention of keeping their liability to a minimum. This peer pressure on account of social collateral between the participants since they are all known to each other results in bringing about an automatic transparency as seen primarily in microfinance institutions.¹¹⁵

It is thus the case of the researcher that the Information Utility will have the role of regulating and monitoring the blockchain rather than working as an active intermediary attempting to sort out the dispute that has so arisen.

It is thus observed that the Information Utility universe does not need a mastermind, it only needs an impartial and trusted facilitator – a mediator with the power to enforce rules. Blockchain represents a form of trusted intermediary code. By encoding the rules of the game as computer programs and by allowing different entities with differing interests to collaborate on an immutable ledger, blockchains lead to a system that seamlessly adheres to the rule and fulfils the promise of not allowing transactions that did not comply to the agreed conditions. The interest amongst the development community for blockchain stems from its perceived ability to ‘solve’ problems in contexts characterised by lack of trust, information and power asymmetries, as well as inefficient systems more generally. Blockchains create trust by acting as a shared database, distributed across vast peer-to-peer networks that have no single point of failure and no single source of truth, implying that no individual entity can own a blockchain network, and no single entity can modify the data stored on it unilaterally without the consensus

¹¹⁵ The reference here is of the success enjoyed by micro-finance institutions in terms of rate of loan repayment. It was seen that majority of the people who were debtors in a micro- finance network were weary of not being able to pay the loan on time as there was a fear of loss of reputation and social collateral which emanated out of the fact that everyone knew everyone in the micro-finance setup and would be immediately called out for non-payment of loan and resultant failure of the setup. This fundamental transparency is what drive people (initial generations) to ensure that loan repayment happened as per schedule and that no one suffered a reputational loss. W.r.t the current research paper the researcher is of the view that the transparency within a blockchain of a particular transaction would have a similar effect leading to success of the entire process.

of its peers. New data can be added to a blockchain only through agreement between the various nodes of the network, a mechanism known as distributed consensus. Each node of the network keeps its own copy of blockchain's data and keeps the other nodes honest – if one node changes its local copy, the other nodes reject it. This interest has also prompted a proliferation of development-related literature on the subject as discussed subsequently.

The fundamental difference between a technique employed by a blockchain and software at IU is efficiency and speed generated on account of transparency within the process. If diagram D7 were to be super-imposed on D8, one would be able to witness a very efficient, transparent and democratically run Information Utility institution.

9. Blockchain in other Jurisdictions

Blockchain has since its introduction attracted immense attention with many organisations testing its feasibility for use in arenas other than crypto-currency. Blockchain as discussed earlier is the functional structure of cryptocurrency allowing for transparent and efficient use, transmission and storage of digital currency. Blockchain technology has since been tested by various institutions, companies and governments in areas of governance, maintenance of public records¹¹⁶, recording of financial matters, insurance matters, subsidy awards¹¹⁷ etc. In the years since the Addis Ababa Action Agenda (AAAA)¹¹⁸ of United Nations, first called for a new financing framework for sustainable development using technological innovations, a number of agencies, particularly multilaterals, have been experimenting with blockchain technology. For instance, the World Bank established a Blockchain Lab in 2017, and humanitarian organisations such as the United Nations Children's Fund (UNICEF) and the World Food Programme (WFP) continue to explore the benefits of employing blockchain to facilitate the disbursement of cash-based aid and digital identities¹¹⁹. Amongst others, USAID¹²⁰ and the

¹¹⁶ Coppi, G. and L. Fast (2019), "Blockchain and Distributed Ledger Technology in the Humanitarian Sector", Overseas Development Institute, HPG Commissioned Report, <https://www.odi.org/sites/odi.org.uk/files/resource-documents/12605.pdf>

¹¹⁷ Coinfy (2017), Hack the Future of Development Aid, https://www.bond.org.uk/sites/default/files/resourcedocuments/hack_the_future_december_2017.pdf. [8] ConsenSys (2020), <https://consensys.net/>.

¹¹⁸ United Nations (2015), Addis Ababa Action Agenda, https://www.un.org/esa/ffd/wpcontent/uploads/2015/08/AAAA_Outcome.pdf.

¹¹⁹ Pisa, M. (2018), "Reassessing Expectations for Blockchain and Development", Center for Global Development Note, <https://www.cgdev.org/sites/default/files/reassessing-expectationsblockchain-and-development-cost-complexity.pdf>.

¹²⁰ Nelson, P. (2018), A Primer on Blockchain, <https://www.usaid.gov/sites/default/files/documents/15396/USAID-Primer-Blockchain.pdf>.

German Development Agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH¹²¹ have both published primers on blockchain. Elsewhere, the Danish¹²² and United Kingdom development agencies published their own documents exploring the ways in which blockchain could be used to enhance aid and development programmes¹²³. In parallel, the key messages from the annual Blockchain Africa Conference demonstrate that a growing number of developing countries are seeking to be included in this conversation.¹²⁴

Blockchain technology has caught the attention of the institutions worldwide with global alliances, research labs, strategy documents, pilot studies and feasibility studies. It is being seen as having the potential to transform economies and industries and according to Niti Aayog block chain could generate USD 3 trillion per year in business value by 2034. Similarly, the World Economic Forum anticipates that 10% of the global GDP would be stored on blockchain by 2025 and is hailing it as a revolutionary, game changer technology. Given below are the views of Niti Aayog, World Bank, OECD and IMF w.r.t the use of blockchain in various facets of the economies.

(a) Niti Aayog

Niti Aayog is the premier institution tasked with the job of planning and strategizing future course of action to be adopted by the Central Government for the purposes of improving governing structures in India. Government of India in the last half a decade has introduced various concepts ranging from citizen's charter to protection of whistle-blowers to empowering people at grassroots using the fundamental conception that government is of the people by the people and for the people. It is thus no surprise that a concerted effort has been initiated to study blockchain technology's application, suitability, application and implications for governing structures in place in India. Mr Rajiv Kumar, the Vice-President of Niti Aayog has given a very invigorating forward in the strategy paper recognizing the need for integrating

¹²¹ GIZ Blockchain Lab (2019), Blockchain: A World Without Middlemen? Promise and Practice of Distributed Governance, https://www.giz.de/en/downloads/giz2019_en_blockchain_world_without_middleman.pdf

¹²² Mulligan, C. (2016), Application of Distributed Ledger Technology within Department for International Development. And Mulligan, C., P. Godsiff and A. Brunelle (2020), "Boundary Spanning in a Digital World: The Case of Blockchain", <https://doi.org/10.3389/fbloc.2020.00037>.

¹²³ Coinfy (2017), Hack the Future of Development Aid, https://www.bond.org.uk/sites/default/files/resourcedocuments/hack_the_future_december_2017.pdf. [8] ConsenSys (2020), , <https://consensys.net/>.

¹²⁴ Medium (2017), Fintech for All: Seso founder on building a blockchain land registry for Africa, https://medium.com/@The_LHoFT/fintech-for-all-seso-founder-on-building-a-blockchain-landregistry-for-africa-6909c27d141d. and Move Africa Forward (2020), Blockchain Africa Conference. <https://blockchainafrica.co/event/blockchain-africa-conference-2020-johannesburg/>

blockchain technology within multiple aspects of government and private sector operations as extracted below:

“‘Blockchain’ has emerged to become a potentially transformative force in multiple aspects of government and private sector operations. Its potential has been recognized globally, with a variety of international organizations and technology companies highlighting the benefits of its application in reducing costs of operation and compliance, as well as in improving efficiencies. While the technical underpinnings of the technology can be intimidating to a large section of policy and decision makers – simply and functionally, blockchain can enable ease of collaboration for enterprises and the ease of living for our citizens by bringing in transparency across government and private sector interfaces.”¹²⁵

Niti Aayog has conducted a pilot study in the areas of land record management, supply chain of medical products, insurance mechanisms, chit funds management, fertilizer subsidy, immunisation records, legal contracts(feasibility of smart contracts), authenticity of educational certificates and direct benefit transfers. These areas specifically involve maintenance of records, public participation with government acting more as an intermediary and ensuring that services reach the beneficiaries on time and as per the entitlements. It is also pertinent to note that these systems seek decentralised peer to peer transactions so as to add socio-economic value and not simple maintaining a ledger of records and details of land ownership, vaccination of children, authenticity of educational certificates (class 10, class 12, undergraduate), or payment of subsidies and other benefits.

Niti Aayog has suggested that. with the development of Digital Ledger Technology, it may not be necessary for the government to maintain records anymore (in the clerical sense) . A peer-to-peer network with government as one of the players in the network can be a great way to revolutionize the transactions in the economy. The network will maintain the records of transactions (government need not deploy resources to maintain that ledger) and government being a player can also regulate and monitor the transactions. Further the strategy paper goes on to state that the blockchain would remove the need for unnecessary middlemen and force integrity and accountability upon those that may previously have been corrupt. The operations would benefit from a system in which no party owns the data yet multiple stakeholders can

¹²⁵ Statement by Mr. Rajiv Kumar, Vice-Chairman Niti Aayog, in the Draft Discussion Paper, Blockchain: The India Strategy (Part 1) https://niti.gov.in/sites/default/files/2020-01/Blockchain_The_India_Strategy_Part_I.pdf

view and modify, this shared database should be permissioned, such that the various parties may only read or write fragments of data that pertain to them.

(b) OECD¹²⁶

The Organisation of Economic Cooperation and Development has in recent years contributed immensely to the study of use, applicability, and feasibility of blockchain technology in both the public and private sector. The organisation has set up a research lab wherein applicability of blockchain to Small and Medium Enterprises Sector, the Public Sector, Pharmaceutical sector has been conducted. They have conducted various pilot studies in various countries to test the feasibility of blockchain technology. This feasibility study has been conducted in line with various international calls for establishing sustainable developmental network¹²⁷, supply chain management, documentation of migrants and refugees¹²⁸, people seeking asylum, facilitation of disbursement benefits¹²⁹, data recording for land titles, patient records, immunisation¹³⁰ etc. OECD has been researching the use of blockchain technology for improving governance structures in member countries with the aim of boosting economies, industrial growth with improved worker participation all in conjunction with the effort to ensure that workers are documented, citizens and residents receive health, social, medical and educational support from the state and that there is neither exploitation nor invisibility of the people who support and add value to the industrial growth. Given below the chart indicating growth and development of Blockchain Technology across the OCED world.

¹²⁶ s Boiardi, P. and Stout, E. (2021) “To what extent can blockchain help development co-operation actors meet the 2030 Agenda?” OECD Development Co-operation Working Papers, No 95, OECD Publishing, Paris, May 2021

¹²⁷ Kleffmann, P. (2019), Blockchain technology for partnerships at eye-level, <https://www.dandc.eu/en/article/new-digital-platform-designed-kfw-facilitates-transparent-andsecure-implementation-oda>.

¹²⁸ Smith, A. (2019), How the World Food Programme uses blockchain to better serve refugees, ITU News, <https://news.itu.int/how-the-world-food-programme-uses-blockchain-to-better-serverefugees/>.

¹²⁹ Mckechnie, A. and F. Davies (2013), “Localising Aid, is it worth the risk?”, Centre for Aid & Public Expenditure.

¹³⁰ Klingebiel, S., T. Mahn and M. Negre (2016), “Fragmentation: A Key Concept for Development Cooperation”, in The Fragmentation of Aid, Palgrave Macmillan UK, London, http://dx.doi.org/10.1057/978-1-137-55357-7_1



(c) World Bank: International Finance Corporation¹³¹

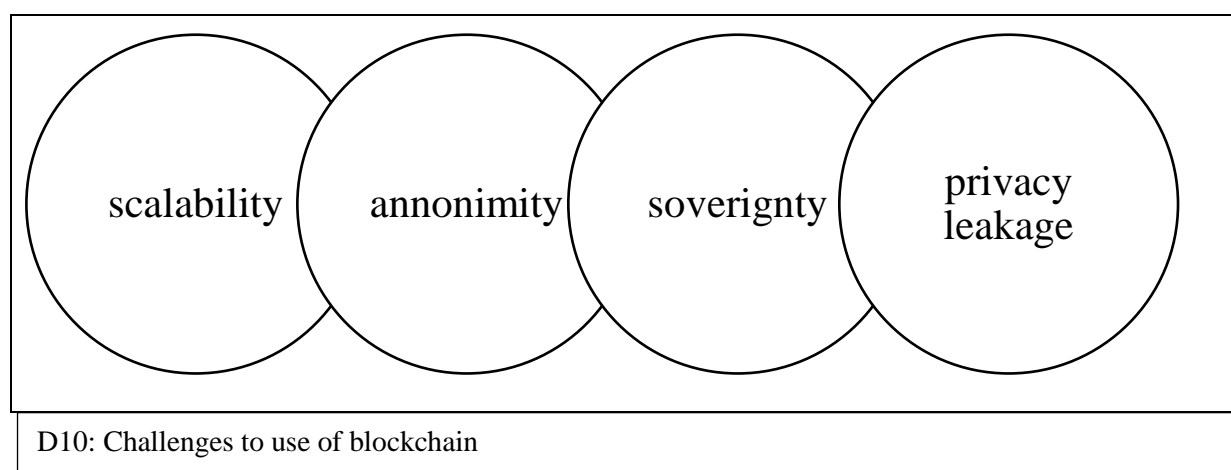
The World Bank Group is seeking to establish universal financial access by 2021 and the International Financial Corporation as the name suggests is the financial arm of the sector. Continued digital transformation of financial services is critical to the shared objective of the two. It is the view of the organisation that digital finance's efficient reach will help bank the unbanked population of the world. Thus existing and newly emerging technologies viz: mobile networks, cloud-based services, and big-data analytics, and blockchain technology respectively need to be integrated so as to achieve this shared vision of taking banking to deepest corners of the world. Distributed ledgers may provide some of the infrastructure these markets need. The World Bank view thus needs to be read in the light of an enforcement seeking its members and participants to pick up the mantle and look for ways to use DLT based blockchain technology. It is noteworthy that significant amount of work has been done in different countries in order to implement the vision of World Bank as documented in Annexure-III. The

¹³¹ DOUGLAS MILLER et al BLOCKCHAIN: Opportunities for Private Enterprises in Emerging Markets, Second and Expanded Edition, January 2019 available at <https://documents1.worldbank.org/curated/en/260121548673898731/pdf/134063-WP-121278-2nd-edition-IFC-EMCompass-Blockchain-Report-PUBLIC.pdf>

World Bank consequently set up the Blockchain Labs in 2017 to conduct research on use and feasibility of blockchain technology within the financial sector.

10. Challenges in working with Blockchain Technology

In the discussion above the researcher has discussed at length as to why blockchain technology can be implemented as the foundational functional mechanism for functioning of the Information Utility, yet it is imperative at this stage to discuss some of the short comings that blockchain technology suffers from, for which solutions may be required to be ascertained before applying them to Information Utility. One of the fundamental challenges is the creation of the unified digital infrastructure for integrating different technologies within the blockchain. These challenges are discussed below and pictographically summarised in D10:



(a) Scalability

The fundamental issue with use of blockchain in an Information Utility is scalability of operations. Since the data to be used is financial data which is coming from different banks and financial institutions both Indian and International, there will be a significant challenge for the programme writer of blockchain for Information Utility to integrate different designs and method of financial reporting¹³² unless the Government of India mandates not just companies but all banking institutions to follow one method of financial reporting accepted globally. Till such time that financial reporting systems are integrated there will be significant challenge in using blockchain for Information Utility in India.

¹³² Standards mandated by the Ministry of Corporate Affairs in line with global best practices.

(b) Privacy Leakage

Blockchain mechanism is used for ensuring transparency of the data collection, dissemination and evaluation thereby allowing every participant in the process to have equal access to all the financial information. Financial Information is essentially the life blood of a company and in the wrong hands could cause significant damage to the economic health of both the creditor and the debtor. In such scenario significant regulations need to be in place in order to ensure no participant divulges information to unauthorised person or use the information to the disadvantage of the network. Thus, rules akin to Insider trading regulations or Investment advisor regulations may need to be put in effect before applying blockchain technology to Information Utility.

(c) Anonymity

Blockchain revels in the depths of anonymity and it is possible for a network node to be present anonymously while interacting with the network even though the actual details would have been supplied to the network's data centre with authentication being completed through digital signatures.¹³³ Yet in some methods anonymity can be maintained causing significant confusion w.r.t. the actual participant to the network. In this scenario technological solutions will be needed to ensure that the network's integrity is not compromised on account of anonymity of a participant or a node.

(d) Sovereignty

Blockchain was the underlying the concept of bitcoin and at the time of popularising of blockchain it was contended that the existence of first block is not known as regards the control to which that block is subject to.¹³⁴ There is a string possibility that the owner of the first block may be able to access and gain control to other blockchains and use it to his own advantage and to the prejudice of other people. Thus, a technological solution will have to be sought in order to implement a fully secure Indian Blockchain with no interference from any of the unauthorised sources.

11. Conclusion

It is no doubt that the corporate economy is essentially comprised of numbers which can be verified and validated at a moment's notice. However, the fundamental problem plaguing the

¹³³ Usha Rodrigues, Law and Blockchain, Iowa Law Review, Vol. 104, 2018, University of Georgia School of Law Legal Studies Research Paper No. 2018-07

¹³⁴ Fulmer, Nathan (2019) "Exploring the Legal Issues of Blockchain Applications," Akron Law Review: Vol. 52 : Iss. 1.

Indian insolvency regime under BIFR and other laws has been lack of consensus on numbers claimed by the parties involved in the process of insolvency resolution. The Code brought about a paradigm shift in the insolvency law and process by overhauling the existing systems and prioritising rights of exit and debt realisation for corporate debtors and creditors respectively. Thus, the Code has identified a unique mechanism of ensuring, transparency, validation and an effective and efficient mechanism of recording and verifying financial data in the form of Information Utilities. Information Utilities as discussed in earlier sections is a repository of financial data for the benefit of all stakeholders in the corporate economy. It was in this backdrop that the researcher aimed at analysing the success of NeSL in India and was shocked to discover that that Information Utility as a concept has failed to garner the desired interest amongst the stakeholders and with the result it has failed to fulfil the objective laid down in the Code.

Thus, the researcher with the intention of finding a plausible solution has conducted the research with the following hypothesis:

To increase the use of Information Utilities, reinforce trust, spread awareness a technological transformation in the form of blockchain would be required in the functioning of Information Utilities for ensuring absolute transparency and accountability. Data collected and analysed by the researcher in support of the hypothesis indicates that there is a trust deficit amongst all the stakeholders primarily the debtors and creditors as are suspicious of the functioning of the Information Utility primarily on account of lack of information pertaining to the methodology followed by it. The Insolvency Professionals interviewed for the purposes of the study are of the view that the lack of transparency of about the methodology followed for storing and securing the safety of the data has resulted in higher concerns about the functioning of the information Utility. It is the case of the researcher that use of blockchain technology for storing and accessibility of the financial information within the Information Utility functional network would help ease suspicions espoused by the stakeholders. Blockchain technology uses an open network for its participants whether in a public, private or consortium structure allowing all participants equal access to information thereby ensuring transparency and promoting information symmetry in financial services amongst the stakeholders. Using blockchain would entitle both the debtors and creditors to notify, verify and rectify loan agreements, terms and conditions pertaining to credit and securitisation of assets. An open network will accelerate dispute resolution as scope for circulation of incorrect or unverified information will get limited on account of the decentralisation of processes within the blockchain setup. This sentiment

about blockchain technology has been shared by various national and international bodies with success stories emerging from jurisdictions across the globe. Blockchain mechanism will also help increase the effectiveness and efficiency of the credit economy on account of increased accessibility and availability of data amongst the stakeholders. It can thus be concluded that the using blockchain as a fundamental functional tool in Information Utility will help make it more effective and approachable by the stakeholders for storing, accessing and disseminating financial data within the corporate credit economy of the country. Thus, the hypothesis stands proved.

In order to answer the above stated hypothesis the researcher sought answers to the following research questions:

Q1. How does Information Utility function as envisaged by the Insolvency and Bankruptcy Code, 2016?

The Banking Law Reforms Committee envisions a competitive industry of information utilities who hold an array of financial information about all firms at all times. When the IRP commences, within less than a day, undisputed and complete information would become available to all persons involved in the IRP and thus address this source of delay. The Information Utility is thus a repository of all financial information pertaining to the companies within the corporate sector.

Q2. What is the nature of work/ output desirable of an Information Utility for the purposes of the Insolvency and Bankruptcy Code 2016?

The Information Utility is to ensure availability of reliable information with real time efficiency establishing repositories of financial data with authenticated and verified data allowing all stakeholders equal access to financial information. It is the case of the researcher that Information Utilities form the fulcrum ensuring sustained credit realisation further accentuating credit delivery within the credit economy of India on account of the collection, collation and dissemination of real time financial data.

Q3. To what extent has Information Utilities been successful in bridging the gap of information asymmetry between the debtors and the creditors?

It is very encouraging to note that at least 24% respondents felt it is work in progress and that it is likely to be successful in future while 5% admitted to Information Utility functioning well.

However, in Q3 the researcher was faced a significant dichotomy in terms of responses from the sample population. While in Q2 nearly 58% of the sample reserved comments w.r.t. their knowledge about the functioning of the Information Utility, yet in Q3 63% claimed to know that Information Utility is not functioning. This response seems to be generated on account of opinions rather than actual knowledge and hence needs to be looked at accordingly.

Q4. To what extent have the IU agreements been able to achieve/ help achieve the objectives of the IU in terms of collecting, collating, analysing and disseminating financial data?

As per data analysed above NeSL has been pushing to execute agreements with the stakeholders in the corporate economy, however it has failed to achieve the fundamental objective of collecting, collating, analysing and disseminating the financial data as the numbers of agreements executed are in no way commensurate with the data on-boarded by the NeSL during actual CIRP processes.

Q5. What is the feasibility of integrating the functioning of Information Utilities and Blockchain Technology?

Research conducted indicates that the Information Utility being a repository of the financial data received from various stakeholders fundamentally seeks to collect and verify financial data which can then be disseminated and analysed for the benefit of the stakeholders during CIRP process. Blockchain technology can be employed as the foundational technique for working Information Utility to increase transparency, efficiency and efficacy of working of Information Utilities.

Q6. What is nature of working of Blockchain Technology?

Blockchain Technology generally uses distributed ledger technique which helps store any information in transparent and immutable blocks with access to only the approved members of the blockchain ensuring no information is mutated or erased to the detriment of other members and is accessible to the permitted persons for verification as and when the need arises.

Q7. What are the advantages and challenges likely to present in integrating Blockchain Technology with Information Utilities?

While blockchain is an extremely promising technology allowing for increased transparency, immutability, and consensus-based verification there exist significant challenges of

sovereignty, scalability as well as interoperability that need to be scaled before finally implementing it as the foundational technology for Information Utility in India.

The response to the hypothesis and research questions helps one reach a conclusion that success of Information Utility is essentially based on improving the trust deficit, improving the echelons of transparency and allowing faster verification processes which as per the current study and scientific trend can be achieved by using blockchain technology as the foundational technological structure for collecting, collating, verifying, analysing and disseminating financial data amongst the stakeholders within the corporate economy. Thus, it is suggested that an attempt be made to execute Information Utility through the modicum of blockchain technology.

Annexure-I

Shareholding Pattern of NeSL as on 30th March, 2020

S.No	Name of the Shareholders	Residential Status	No. Shares held	Value of share in Rs.	Shareholding (%)
1.	Life Insurance Corporation of India	Resident	45,00,000	4,50,00,000/-	6%
2.	State Bank of India	Resident	75,00,000	7,50,00,000/-	10%
3.	Canara Bank	Resident	75,00,000	7,50,00,000/-	10%
4.	Bank of Baroda (includes 30,00,000 Shares of Dena Bank post-merger with BOB w.e.f. 1.04.2019)	Resident	105,00,000	10,50,00,000/-	14%
5.	ICICI Bank Ltd.	Resident	74,25,000	7,42,50,000/-	10%
6.	Central Depository Services Limited	Resident	30,00,000	3,00,00,000/-	4%
7.	Union Bank of India	Resident	37,50,000	3,75,00,000/-	5%
8.	New India Assurance Co. Ltd.	Resident	37,50,000	3,75,00,000/-	5%
9.	United India Insurance Co. Ltd.	Resident	15,00,000	1,50,00,000/-	2%
10.	HDFC Holdings Ltd.*	Resident	37,50,000	3,75,00,000/-	5%
11.	Punjab National Bank	Resident	37,50,000	3,75,00,000/-	5%
12.	Indian Bank	Resident	37,50,000	3,75,00,000/-	5%
13.	National Bank For Agriculture & Rural Development	Resident	15,00,000	1,50,00,000/-	2%
14.	Axis Bank Ltd.	Resident	71,25,000	7,12,50,000/-	10%
15.	Small Industries Development Bank of India	Resident	12,00,000	1,20,00,000/-	2%
16.	Karnataka Bank Ltd.	Resident	45,00,000	4,50,00,000/-	6%
	Total		7,50,00,000	75,00,00,000/-	100%

*HDFC Holdings Limited, is a wholly owned subsidiary of HDFC, whose majority shareholders are Non- Resident entities.

Annexure-II

Amount of Non-Performing Assets with Shareholding Banks in NeSL (Source: RBI DMIE data)

Bank	Amount of NPA for 2019-2020 (Amount in Crore)
State Bank of India	149091.85
ICICI	40829.09
HDFC	12559.38
Union Bank of India	49085.31
Canara Bank	37041.15
Bank of Baroda	69381.43
Punjab National Bank	73478.76
Axis Bank	26604.10
NABARD	703.90
Indian Bank	14150.84
SIDBI	189.57
Karnataka Bank	2799.93

Annexure-III

Pilot Study for Research on Understanding the efficacy of Information Utilities in India

Interview Schedule

Q1. Do you know about Information Utility's establishment in India?

So you do know about NeSL? (follow-up question raised in case of doubt)

Q2. Have you used Information Utility?

Q3. What is your view about functioning of Information Utility in India?

Q4. Do you feel that Information Utility is successful in India?

Q5. Do you feel that NeSL has brought about the information symmetry as promised by the Insolvency and Bankruptcy Code of India?

Annexure-IV

Extract from World Bank Report by Douglas Millar and others highlighting the penetration of Blockchain Technology across the world. (Please note this has been exactly extracted from the report and the researcher has made no changes in the same)

DOUGLAS MILLER et al BLOCKCHAIN: Opportunities for Private Enterprises in Emerging Markets, Second and Expanded Edition, January 2019 available at <https://documents1.worldbank.org/curated/en/260121548673898731/pdf/134063-WP-121278-2nd-edition-IFC-EMCompass-Blockchain-Report-PUBLIC.pdf>

“Continuing with the intent of achieving universal financial access the world bank has in jurisdictions with limited formal banking penetration or absence of string traditional banking system with relatively high volatility in terms of political and economic risks resulting in large unserved customer segments supported various initiatives allowing digitisation of financial markets. These initiatives include but are not limited to BitPesa (Kenya¹³⁵), Bitso (Mexico), Remit.ug (Uganda), Satoshi Tango (Argentina), BitSpark (Hong Kong), OkCoin (China), OkLink/Coinsense (India), Coinnect (Mexico/Argentina), Rebit and Coin.ph (Philippines). There are also large players in this space, including MPesa, a mobile money transfer service launched by telecommunications giant Vodafone in Kenya, and e-commerce companies, including AliPay, a subsidiary of China’s Alibaba.

While Europe and the United States continue to lead the world in blockchain adoption and innovation, their dominance is now being challenged by Asia—and China in particular—which is rapidly increasing its share of global blockchain venture capital financing. Blockchain-based applications and services are also springing up across Africa and Latin America. Cognizant of blockchain’s substantial potential benefits for their citizens, but also wary of the risks, emerging market governments are taking this technology seriously. Some are even becoming major financial supporters of the technology with the hope of using it to provide their citizens and economies with a technological advantage and a boost to growth. China, for example, has explicitly made blockchain a pillar of its economic development strategy and is pushing regulators and industry to collaborate on emerging standards.

China is a noteworthy player in this classification, with companies that have a dynamic presence in both segments (start-ups and large established players), with regional coverage across Asia and venture capital investors who have global ambitions beyond

¹³⁵ BBC (2019), Crypto-currencies gaining popularity in Kenya, <https://www.bbc.com/news/business-47307575>

emerging markets. Bridging the institutional gap. The positive effect of blockchain in emerging markets is clearly visible.

The Society for Worldwide Interbank Financial Telecommunication (SWIFT) has announced an initiative exploring the use of blockchain in trade finance. Seven major European banks (KBC, Deutsche Bank, HSBC, Natixis, Rabobank, Société Générale and UniCredit) are partnering on a new blockchain-based permissioned trade finance platform, Digital Trade Chain, to manage open account trade transactions for both domestic and international commerce, from initiation to settlement. DTC allows authorized parties to track the progression of those transactions. The goal is to cut transaction costs for European businesses, particularly those of modest-sized firms. Similarly, Standard Chartered is leading the Distributed Ledger Technology Trade Finance Working Group (formed under the Hong Kong Monetary Authority's Fintech Facilitation Office) to deliver a proof of concept, developed in collaboration with the Bank of China, Bank of East Asia, Hang Seng Bank and HSBC and Deloitte Touche Tohmatsu. In another pilot, HSBC joined forces with Bank of America Merrill Lynch and the Infocomm Development Authority of Singapore (IDA) to develop a prototype solution built on blockchain for letters of credit in a smart contract. The consortium used the Linux Foundation open-source Hyperledger Project Fabric (whose development was supported by IBM). In the United Arab Emirates, Infosys has partnered with Emirates NBD and ICICI to deliver the first blockchain based trade finance (and remittances) solution in the region."

Bibliography and References

Reports

1. Deep shift: Technology tipping points and societal impact, World Economic Forum, September 2015, [weforum.org](https://www.weforum.org).
2. Government of India, Report of the Banking Commission 1972, Chairman R.G. Saraiya
3. Reserve Bank of India, “Report of the Working Group to explore the possibilities of setting up a Credit Information Bureau in India” (Department of Banking Operations and Development, October 1999)
4. Reserve Bank of India Department of Banking Operations And Development, “Report of the Committee to Recommend Data Format for Furnishing of Credit Information to Credit Information Companies”, 2014, Aditya Puri
5. Recent Policy initiatives in Credit Information Sharing (Keynote Address delivered by Shri R. Gandhi, Deputy Governor on March 3, 2015 at Seventh Annual CIBIL TransUnion Credit Information Conference, Hotel Trident, Mumbai)
6. Reserve Bank of India, “Report of the Committee to Recommend Data Format for Furnishing of Credit Information to Credit Information Companies”, (Department of Banking Operations and Development, January 2014)
7. Banking Law Commission Report
8. The National E-Governance Services Limited, details about the board of NeSL available at <https://nesl.co.in/the-board/>
9. The compliance report of 2019-20 submitted by NeSL to IBBI available at <https://nesl.co.in/wp-content/uploads/2020/12/Annual-Compliance-Certificate-2019-20.pdf> ; As per Regulation 8, Chapter III, Insolvency
10. Information Utilities: A Key Pillar of Insolvency Proceedings Information Brochure, 30th November, 2020, IBBI, <https://www.ibbi.gov.in/uploads/publication/ee64e0a0330c81c11c0ab538b5e4b946.pdf>
11. Statistical Tables related to Banks in India, Reserve Bank of India, 2020, available at: <https://dbie.rbi.org.in/DBIE/dbie.rbi?site=publications>
12. Non Performing Assets details, Annual Report, NABARD, 2019-2020 available at: <https://www.nabard.org/auth/writereaddata/Flipbook/2020/Nabard-English-Annual-Report-2019-2020/index.html>
13. Non- performing Assets, Annual Report, SIDBI, 2019-2020 available at: https://sidbi.in/AnnualReport201920/pdf/SIDBI%20AR_PartII_English.pdf
14. Submission of Financial Information to Information Utilities, RBI/2017-18/110 DBR.No.Leg.BC.98/09.08.019/2017-18 dated 19th December, 2017, Reserve Bank of India.
15. OECD Blockchain Primer, available at <https://www.oecd.org/finance/OECD-Blockchain-Primer.pdf>
16. NASSCOM Avasant India Blockchain Report 2019, <https://www.nasscom.in/knowledge-center/publications/nasscom-avasant-india-blockchain-report-2019>
17. NeSL 4th Annual Report, 2019-20; available at https://nesl.co.in/wp-content/uploads/2020/09/4th-Annual-Report-NESL_2019-20.pdf

Articles

1. Anand Prakash, Major Episodes of Volatility in the Indian Foreign Exchange Market in the Last Two Decades (1993-2013): Central Bank's Response, Reserve Bank of India Occasional Papers Vol. 33, No. 1 & 2: 2012 available at <https://rbidocs.rbi.org.in/rdocs/Content/PDFs/8MEVIF270614.pdf>
2. Apar Gupta and Akshay Sapre, Commentary On Information Technology Act– With Rules, Regulations, Orders, Guidelines, Reports And Policy Documents, Lexis Nexis, 2015
3. Brant Carson, Giulio Romanelli, Patricia Walsh, and Askhat Zhumaev, Blockchain beyond the hype: What is the strategic business value? McKinsey Digital, June 19, 2018 available at <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/blockchain-beyond-the-hype-what-is-the-strategic-business-value>. Last accessed on 12th May 2021
4. Bharath, S. T., P. Pasquariello, and G. Wu. 2009. 'Does Asymmetric Information Drive Capital Structure Decisions?' *Review of Financial Studies* 22 (8): 3211–43.
5. Cass R. Sunstein, *Simpler: The Future of Government*, 2013
6. Chen, R., Kraemer, K. & Sharma, P. Google: The World's First Information Utility?. *Bus. Inf. Syst. Eng.* 1, 53–61 (2009). <https://doi.org/10.1007/s12599-008-0011-6>.
7. Daniela Klingebiel (2000), *The Use of Asset Management Companies in the Resolution of Banking Crises Cross-Country Experiences*, World Bank;
8. Darcy W. E. Allen, Aaron M. Lane, & Marta Poblet, *The Governance of Blockchain Dispute Resolution*, *The Governance of Blockchain Dispute Resolution - Harvard Negotiation Law Review*, Vol. 25., 1, 2019 available at https://www.researchgate.net/publication/340827439_The_Governance_of_Blockchain_Dispute_Resolution_-_Harvard_Negotiation_Law_Review_Vol_25
9. Ehansen, *Bullish on Blockchain: Examining Delaware's Approach to Distributed Ledger Technology in Corporate Governance Law and Beyond*, 2018, available at <https://www.hblr.org/2018/01/bullish-on-blockchain-examining-delawares-approach-to-distributed-ledger-technology-in-corporate-governance-law-and-beyond>
10. Eatwell, J. M, Milgate and P. Newman(eds), 1989, *Allocation, Information and Markets*, The New Palgrave, London, Macmillan;
11. Fulmer, Nathan (2019) "Exploring the Legal Issues of Blockchain Applications," *Akron Law Review*: Vol. 52 : Iss. 1.
12. F. Xavier Olleros and Majlinda Zhegu. *Research Handbook on Digital Transformations*, edited Edward Elgar, 2016
13. Giovanni Dell' Ariccia, *Asymmetric Information and Market Structure of the Banking Industry*, IMF Working Paper, WP/98/92, June 1998, available at <https://www.imf.org/external/pubs/ft/wp/wp9892.pdf>
14. Hoff K., J. Stiglitz, (1997), *Money Lenders and Bankers: Price Increasing subsidies in a monopolistically competitive market*, *Journal of Development Economics* pp 429-462
15. KVR Murthy, *Working Group Report on Information Utilities*, Ministry of Corporate Affairs, 2017 available at <https://www.ibbi.gov.in/wg-04report.pdf>
16. Kulhari, Shraddha. "The Midas Touch of Blockchain: Leveraging It for Data Protection." In *Building-Blocks of a Data Protection Revolution: The Uneasy Case for Blockchain Technology to Secure Privacy and Identity*, 15-22. Baden-Baden, Germany: Nomos Verlagsgesellschaft MbH, 2018.
17. Kevin Webarch, *The Blockchain and the New Architecture of Trust*, MIT, 2018

18. Lummer, S. L., and J. J. McConnell. 1989. 'Further Evidence on the Bank Lending Process and the Capital-Market Response to Bank Loan Agreements.' *Journal of Financial Economics* 25 (1): 99–122.
19. Lord Hewart CJ, *R v Sussex Justices, ex parte McCarthy*, KB 256, EWHC KB 1
19. Mahdi Salehi, Vahab Rostami, and Hamid Hesari, *The Role of Information Asymmetry in Financial Methods* available at <https://core.ac.uk/download/pdf/25688215.pdf>
20. Marco Iansiti and Karim R. Lakhani, *The Truth about Blockchain*, *Harvard Business Review* 95(1):118-127, January 2017
21. Michael Cassy and Paul Vigna, *The Truth Machine: The Blockchain and the Future of Everything*, St. Martins Press, 2018
22. Michael Crosby and others, *Blockchain Technology and Beyond*, Sutardja Center for Entrepreneurship & Technology Technical Report, Berkeley Engineering, 2015
23. Marten Risius & Kai Spohrer, *A Blockchain Research Framework*, *Business & Information Systems Engineering* volume 59, pages385–409(2017)
24. Makoto Yano, Chris Dai and others, *Blockchain and Cryptocurrency: Building High Quality Market Place for Cryptodata*, Springer 2020
25. Myers, S. C., and N. S. Majluf. 1984. 'Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have.' *Journal of Financial Economics* 13 (2): 187–221.
26. Mckechnie, A. and F. Davies (2013), "Localising Aid, is it worth the risk?", Centre for Aid & Public Expenditure.
27. Medium (2017), *Fintech for All: Seso founder on building a blockchain land registry for Africa*, https://medium.com/@The_LHoFT/fintech-for-all-seso-founder-on-building-a-blockchain-landregistry-for-africa-6909c27d141d.
28. Move Africa Forward (2020), *Blockchain Africa Conference*.
29. Mulligan, C. (2016), *Application of Distributed Ledger Technology within Department for International Development*.
30. Mulligan, C., P. Godsiff and A. Brunelle (2020), "Boundary Spanning in a Digital World: The Case of Blockchain", <https://doi.org/10.3389/fbloc.2020.00037>.
31. Nakamoto, S. (2009), *Bitcoin: A Peer-to-Peer Electronic Cash System*, <https://bitcoin.org/bitcoin.pdf>.
32. Nelson, P. (2018), *A Primer on Blockchain*, <https://www.usaid.gov/sites/default/files/documents/15396/USAID-Primer-Blockchain.pdf>.
33. Nuno Crato and Paulo Purulo(editors), *Data Driven Policy Impact Evaluation*, Springer, 2018
34. Pilkington, Marc, *Blockchain Technology: Principles and Applications* (September 18, 2015).
35. Primavera De Filippi, Aaron Wright, *Blockchain and the Law The Rule of Code*, Harvard University Press, 2018
36. Philip Boucher,, Susana Nascimento, Mihalios Kritikos, *How blockchain technology could change our lives*, *Science and Technology Options Assessment*, European Union Parliament, 2017
37. Pisa, M. (2018), "Reassessing Expectations for Blockchain and Development", Center for Global Development Note, <https://www.cgdev.org/sites/default/files/reassessing-expectationsblockchain-and-development-cost-complexity.pdf>.
38. Prableen Bajpai, *How Stock Exchanges Are Experimenting With Blockchain Technology*, *Nasdaq* (June 12, 2017, 8:50 AM), <http://www.nasdaq.com/article/how-stock-exchanges-are-experimenting-with-blockchain-technology-cm801802>;

39. Ratan Lal and Dhiraj Lal, *The Law Of Evidence*, Lexis Nexis, 2015
40. Ricardo N. Bebczuk, *Asymmetric Information in Financial Markets: Introduction and Applications*, Cambridge University Press 2003
41. Stefan Ingves et al., “Issues in the Establishment of Asset Management Companies”, IMF Policy Discussion Paper, May 2004, PDP04/03
42. Smith, A. (2019), How the World Food Programme uses blockchain to better serve refugees, ITU News, <https://news.itu.int/how-the-world-food-programme-uses-blockchain-to-better-serverefugees/>.
43. Sackman H, Boehm BW (1972) *Planning community information utilities*. AFIPS Press, Montvale and Sackman, H, Nie N (1970)
44. Usha Rodrigues, *Law and Blockchain*, Iowa Law Review, Vol. 104, 2018, University of Georgia School of Law Legal Studies Research Paper No. 2018-07
45. V. Buterin, “On public and private blockchains,” 2015. Available: <https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/>
46. Press Trust of India, Bank of Baroda concludes three-way amalgamation with Dena, Vijaya banks, [https://www.business-standard.com/article/pti-stories/bank-of-baroda-completes-integration-of-erstwhile-dena-vijaya-banks-with-itself-120122000502_1.html#:~:text=In%20a%20first%20three%2Dway,Baroda%20from%20April%201%2C%202019.&text=%22We%20have%20successfully%20completed%20integration,faced%20under%20the%20COVID%20environment](https://www.business-standard.com/article/pti-stories/bank-of-baroda-completes-integration-of-erstwhile-dena-vijaya-banks-with-itself-120122000502_1.html#:~:text=In%20a%20first%20three%2Dway,Baroda%20from%20April%201%2C%202019.&text=%22We%20have%20successfully%20completed%20integration,faced%20under%20the%20COVID%20environment.). Accessed on 10th May, 2021
47. Zetzsche DA; Buckley RP; Arner DW, 2018, 'Blockchain Distributed Ledgers and Liability', *Journal of Digital Banking*, vol. 2, pp. 296 - 308
48. Zwieten (2015), *Corporate Rescue in India: The Influence of the Courts*, *Journal of Corporate Law Studies* Volume1, Oxford Legal Studies Research Paper 37/2014
49. Zibin Zheng, Shaoan Xie, Hongning Dai, Xiangping Chen, and Huaimin Wang, *An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends*, 2017 IEEE 6th International Congress on Big Data, 978-1-5386-1996-4/17